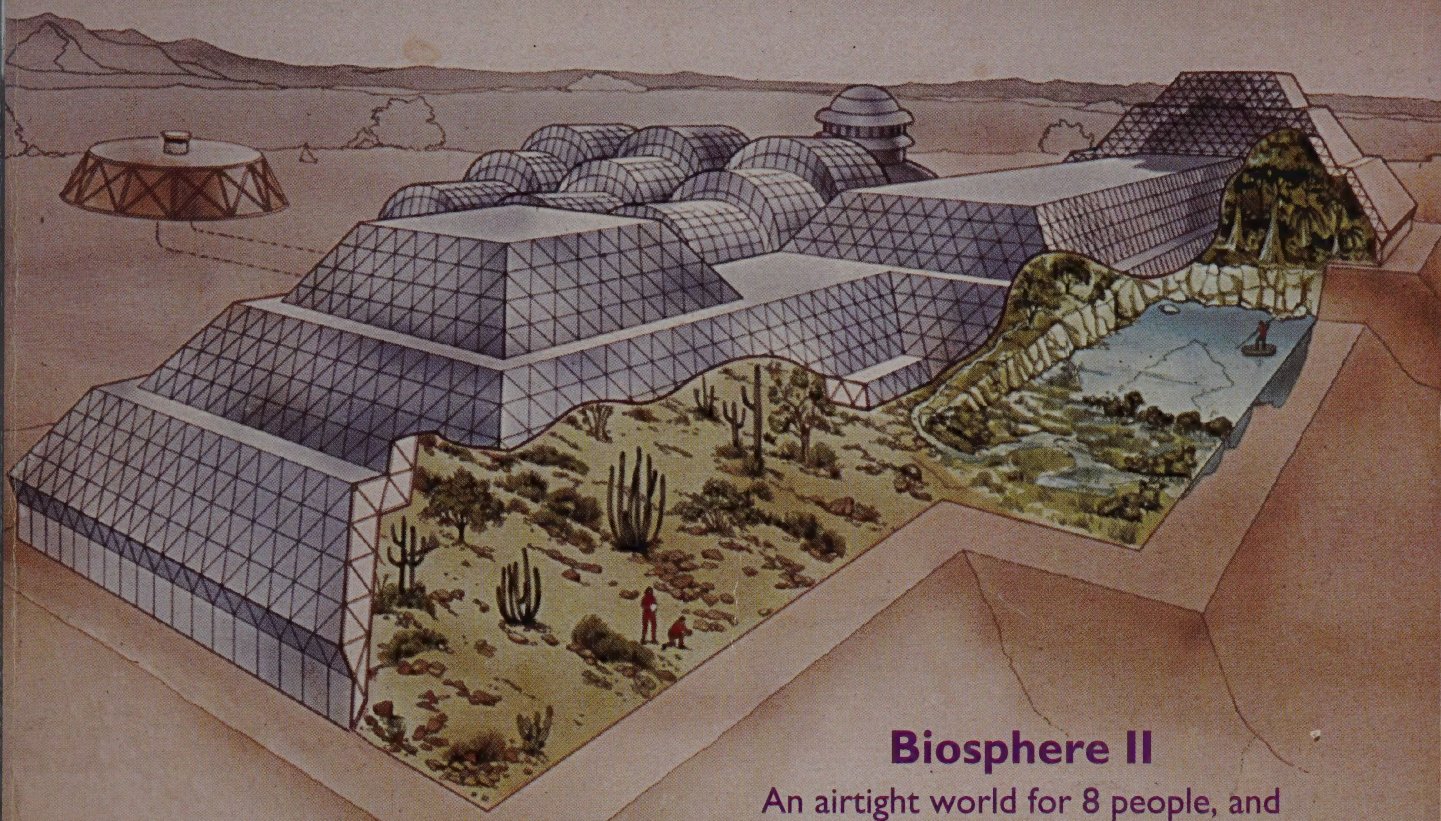
ARTIFICIAL LIFE • ULTRA-SMALL TECHNOLOGY • FLOCKING ROBOTS •
SYNTHETIC REALITIES • SOLAR-POWERED ELECTRONIC COTTAGE

No.67 Summer 1990 $5 ($6 Canadian)

WHOLE EARTH REVIEW

ACCESS TO TOOLS AND IDEAS



Biosphere II

An airtight world for 8 people, and 1,000 other species, to be sealed closed for two years; p. 2

02

0 70989 39594 7

WHOLE EARTH REVIEW

Number 67 **FEATURES** Summer 1990

LITTLE GODS, BIG WORLDS

This issue never set out to have a theme. It began as a serendipitous catch of all that flows through the office, particularly of the many product, book, and catalog reviews piling up on our shelves. Indeed, there are more reviews than usual in this issue. But it is only now, the last week in production, that an alliance among the ideas on these pages has emerged. What you have here is an issue pointing to the reality of autonomous worlds. Virtual universes (p. 80). Manufactured ecologies (p. 2). Artificial life (p. 20). Fabricated matter (p.104). Simulated history (p. 118). All kinds of man-made designs that compete with the everyday world for our sense of what is "real." All kinds of worrisome worlds that seem to be acquiring their own minds and momentum. All kinds of playing god. In short, welcome to the second Creation, the age of Synthetic Realities. —*Kevin Kelly*

FRONT COVER: This rendering of Biosphere II (p. 2), by Johnstone Quinan, originally appeared in *The Washington Post Magazine*. Quinan painted the illustration in a horizontal format. We needed a vertical. In 1985 we produced a digitally manipulated cover of *WER* (#47) using a million-dollar machine built by Scitex. Arrow Systems, Inc., our neighbor at 475 Gate Five Road, Sausalito, sells Macintosh-based color pre-press systems. As an experiment, we asked Jeff Bailey and John Edmondo of Arrow (with assistance from *WER* art director Kathleen O'Neill) to digitally extend the earth and sky in the picture, and to compose the text, logo, and back-cover material. Slides of the artwork were scanned with a Nikon scanner; our logo, with a flat-bed scanner. Arrow reassembled the pieces using a palette of software programs including Color Studio, Quark Express, several Adobe programs, and technical utilities from Pre-press Technologies. The whole kit runs on an accelerated Mac IIx. Together with an Ultre Image Setter, which produces the film negatives needed for printing, the set-up costs about $100,000, a tenth of its cost five years ago.

Whole Earth Review ☐ Issue No. 67 ☐ June 6, 1990 (ISSN 0749-5056) (USPS 077-150). Published quarterly by POINT, a California nonprofit corporation. Editorial office: 27 Gate Five Road, Sausalito, CA 94965; 415/332-1716. Subscriptions $20 per year; single copies $5. Inquire for first class and international air rates. Second-class postage paid at Sausalito, California, and at additional mailing offices. Claims for missing issues will not be honored later than six months after publication. Back issues are available on microfilm and as xerographic reprints from University Microfilms International, Serials Bid Coordinator, 300 Zeeb Road, Ann Arbor, MI 48106. Whole Earth Review is indexed by Access: The Supplementary Index to Periodicals, Alternative Press Index, Magazine Index, Consumers Index, and Humanities Index.

POSTMASTER: Send address changes to Whole Earth Review, P. O. Box 38, Sausalito, CA 94966.

DEPARTMENTS/REVIEWS

Small-time plate tectonics

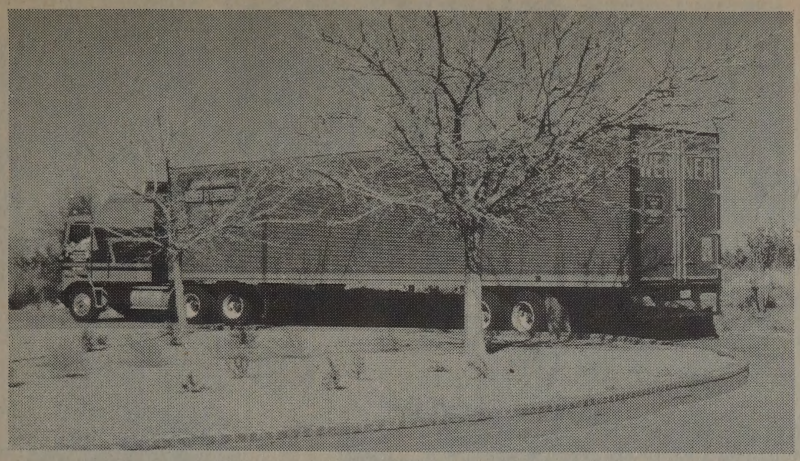
Bio2 is the largest example of a closed, man-made living system. One of the smallest examples to date is the commercially available ecosphere (see *WER* #45). It holds a special combination of water, air, algae and living shrimp in a sealed glass globe. This one, sitting on ecologist Peter Warshall's bookshelf, may, in a Gaian sense, be manufacturing land. On Earth, the deposit of sedimentary rock is in a dynamic equilibrium with the composition of the atmosphere, and the rate of life. Carbon and minerals circulate not only through air and water into life, but into land and rocks, and back again. In Warshall's ecosphere (which has lain undisturbed for years), minerals are precipitated into a layer of solid crystals on the globe's roof. Warshall sees two lessons here. One is that Bio2 might expect to have troublesome mineral deposits accumulate on its glassy roofs. And second, that turbulence is an essential catalyst in ecology, although a somewhat "costly" one to replicate in a man-made environment like Bio2.

Bio-diplomacy

"It's a sticky problem," says Bio2 ecologist Peter Warshall, here checking out a cactus. "It's a pretty impossible job to pick 100 living things, even from the same place, and put them together to make a 'wilderness.'" Ecologists experience all the competitiveness rival organisms do while designing a biome. And as they bicker for water or sunlight rights, it's as if they were ambassadors protecting their borders from encroachments. "I need as much fruit as possible dropped from trees for my turtles to eat," says Bio2 desert ecologist Tony Burgess, "but the turtles would leave none for the fruit flies, which Warshall's hummingbirds need. Should we have more trees for leftover fruit, or use the space for bat habitat?" So negotiations take place: If I can have this flower for the birds, you can keep the bats. Or open subversion, like the debate on whether the marsh-man should have his pick of sawgrass, which Warshall didn't like because it would invade the drylands. Warshall: "Oh, it won't make any difference because I'm just gonna plant taller elephant grass to shade out his stuff, anyway." The marsh-man retaliated by planning acacia trees, taller than either. Warshall is currently scheming a border defense of guava trees, which don't grow any taller, but grow much *faster*, staking out the niche early.

Dirt first!

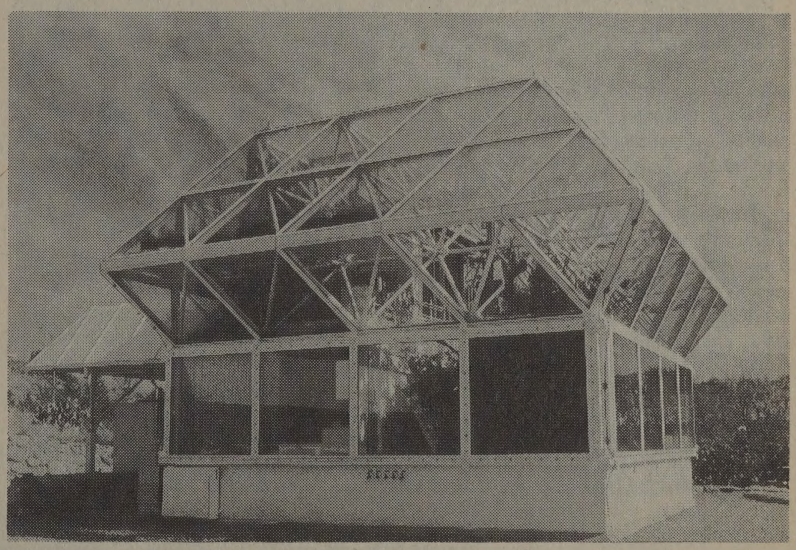
The key to creating ecological regions from scratch is to have the right soil. The ecologists building the wilderness areas of Bio2 are of the school that says: soil makes the ecology. To have the kind of tropical rainforest you want, you need to have the right kind of jungle dirt. And to get that in Arizona you are probably going to have to make it from scratch. Take a couple of bulldozer buckets of basalt, a few of sand, and a few of clay. Sprinkle in the right microorganisms.



Instant ocean

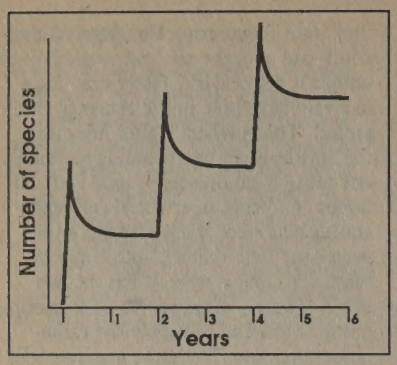
This truck pulls up to the Bio2 office, and the truck driver wants to know where they want their ocean. He's been hauling a full load of ocean salt and would like to unload it before dark. They point down to a very large hole in the center of the project. That's where Walter Adey from the Smithsonian Institution is building a one-million-gallon ocean, coral reef and lagoon. Growing an artificial self-regenerating coral reef of any size has only been done twice before, both times by Adey. This one is huge; it has its own beach. There's an expensive wave-making pump at one end to supply the turbulence coral love. The same machine will create a half-meter tide on a lunar cycle. The trucker unloads the ocean: stacks of 50-lb. bags of Instant Ocean, the same stuff you buy at tropical aquarium stores. A starter solution harboring all the right micro-beasties (sort of the yeast for the dough) will be hauled in on a different truck from the Pacific Ocean. Shake together well, and pour.

Mix in place. In the wild, soils erode or build up, presenting a new soil composition on the surface. This is one reason why the variety of species will vary in one location over geological time, as the mix of species adjusts to new soils. In a highly erosive place like a desert, it is natural for stands of cactus to change in as little as 25 years. Without the turbulence of wind and storms, the soil of Bio2 will be in an enforced stability.



Disturbing the atmosphere with your fingers

Much of the evidence that convinces the Bio2 group that their ark will support eight people for two years has come from extended manned and unmanned runs in this test module. It is crammed with a spectrum of diverse plants, and a microbial water-recycling apparatus similar to the one in Bio2. A whiff of the air inside is overwhelming — shockingly moist, thick and "green." Linda Leigh, biologist and Bio2 candidate, volunteered to solo test-drive it for 21 days. Says she, "At first I was concerned whether I'd be able to stand breathing in there, but after two weeks I hardly noticed the moisture. In fact I felt invigorated, more relaxed, and healthier, probably because of the air-cleansing and oxygen-producing nature of close plants. The atmosphere even in that small space was stable. I felt that the test module could have gone on for the full two years and kept its atmosphere right." Sophisticated monitoring equipment indicated no build-up of gases either from building materials or biological sources. Although the atmosphere was stable overall, it was sensitive to perturbations which caused it to vacillate easily. While digging sweet potatoes out of their beds, Leigh's disturbances of CO_2-producing soil organisms temporarily altered the CO_2 concentration in the module's air. It's unknown what effect tilling the Bio2's larger garden will have.

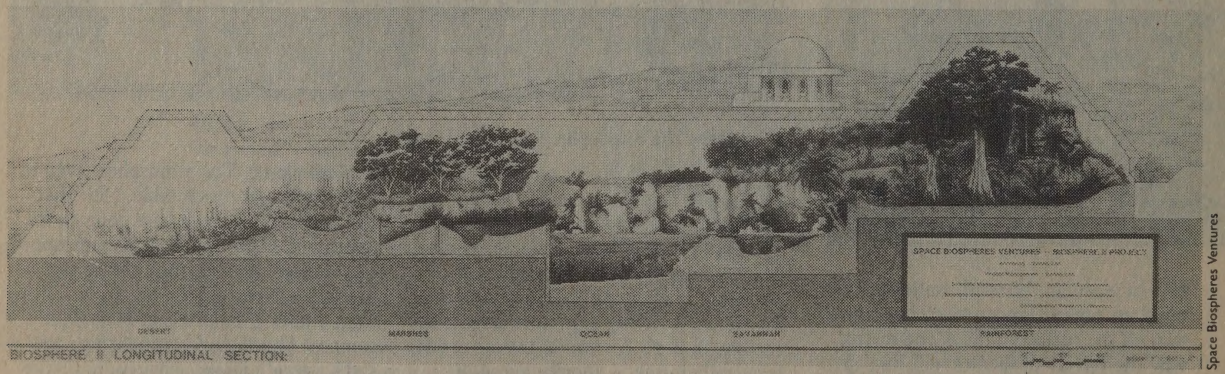


The diversity pump

It is hard to crash an ecosystem, but that's not to say there won't be extinctions. A certain attrition rate is essential for evolution. Walter Adey had about 1 percent extinctions in his two coral reefs. He expects about a 30- to 40-percent drop-off in species within the whole of Bio2 during the first "closure" (the first two-year run). "What we are doing is cramming more species in than we expect to survive. So the numbers drop. Particularly the insects and lower organisms. At the beginning of the next run we overstock it again, injecting slightly different species — our second guesses. What will probably happen is that there will still be a large loss again, maybe one-quarter, but we re-inject again next closure. Each time the numbers of species will stabilize at a higher level than the first. The more complex the system, the more species it can hold. We keep doing that, building up the diversity. If you loaded up Biosphere II with all the species it ends up with, it would collapse at the start." It's a diversity pump that grows complexity.

Animals, by 3 and 5

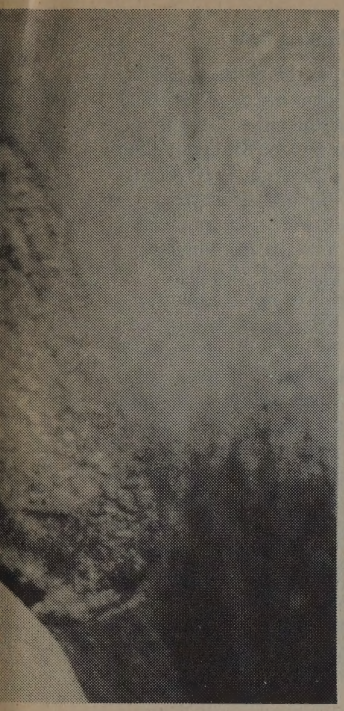
Tony Burgess ordered dune sand to be trucked in for the desert biome because river sand, the only kind on hand, is too sharp for land turtles; it cuts their feet. "You've got to take care of your turtles so they will take care of you." Animal support will be thin in Bio2 at first because there won't be enough wild food to support many of them. This galago from Africa probably won't make it in Bio2 until the second round, after it has been trained to eat fruit from the acacia trees now being planted. The first Bio2 wild-animal occupants will include Texas tortoises, blue-tongued skinks (because they are "generalists" — not picky what they eat), various lizards, small kingfishers, and pygmy green hummingbirds, partially for pollination. "Most of the species will be pygmy, because we really don't have that much space," Warshall told a *Discover* reporter. "In fact, ideally we'd have pygmy people too." And they shouldn't go in two by two. "You want to have a higher ratio of females to males for reproduction insurance," Warshall says. "Ideally we like to have at minimum five females per three males. I know director John Allen says that eight humans — four female, four male — is the minimum-sized group needed for human colony start-up and reproduction, but from an ecologist's view the Bio2 crew should be five females and three males."



Space Biospheres Ventures

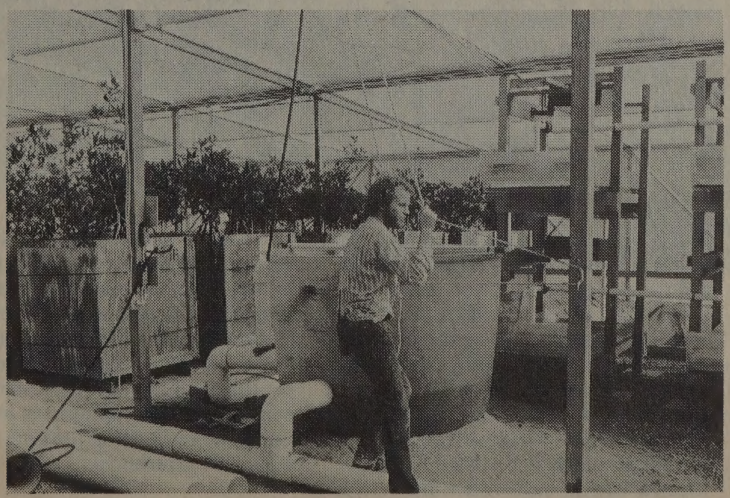
A land ship

The seventh biome of Bio2 features a human ecology. The people habitat is modeled on the highly evolved environments in ships — versatile, high-yield, low-space services. Not a bad model for an ark on land. There are eight one-person "studio" apartments (360 sq. ft. on average), with access to a general-purpose mezzanine. There's a large communal kitchen and a food-processing and storage area. One dining room, one office, one analytical lab, one medical lab, one tissue culture lab, one library with tower deck, one gym, one workshop (amply stocked with spare parts), one laundry room, one veterinary lab (for pets, too), one media studio, and one enclosed plantation garden planted with bananas, avocados, and figs.



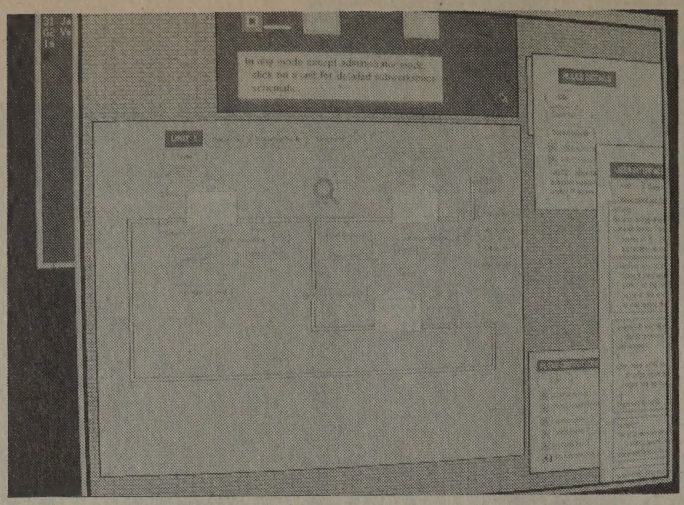
Piping in thunder for the frogs

Constructing a wetlands by re-assembling a natural one is the analog method of biome building. It seems to work fine. "If we were really doing this right, we would be piping in thunder for the frogs," says Warshall. "But we are not really modeling the Earth, we are modeling Noah. How many links can we break and still have a species survive? In reality that's our question." "Well, we haven't had a crash yet!" Walter Adey chuckles. He has built two living coral reefs and a mangrove swamp. His analog swamp gets a thunderstorm when someone turns a gushing water hose onto it. Living mesocosms, even synthetic ones, are hard to break.



Compressing a swamp

A 30-mile stretch of Florida Everglades mangrove swamp is surveyed into a grid. Every half mile or so along the salt gradient, a small cube (four feet deep by four feet square) of mangrove roots and piggy-backing barnacles is dug out and boxed. Reassembled in Bio2, the unboxed marsh blocks will take up only a micro 90 by 30 feet. Each section harbors a mixture of microorganisms with a gradually increasing love of salt. The flow of life from fresh water to brine is compressed into talking distance. While they are waiting to be placed in the marsh, the boxes are hooked up onto a distributed saltwater tide, initiated twice a day by manually hauling on a rope tied to a drain.

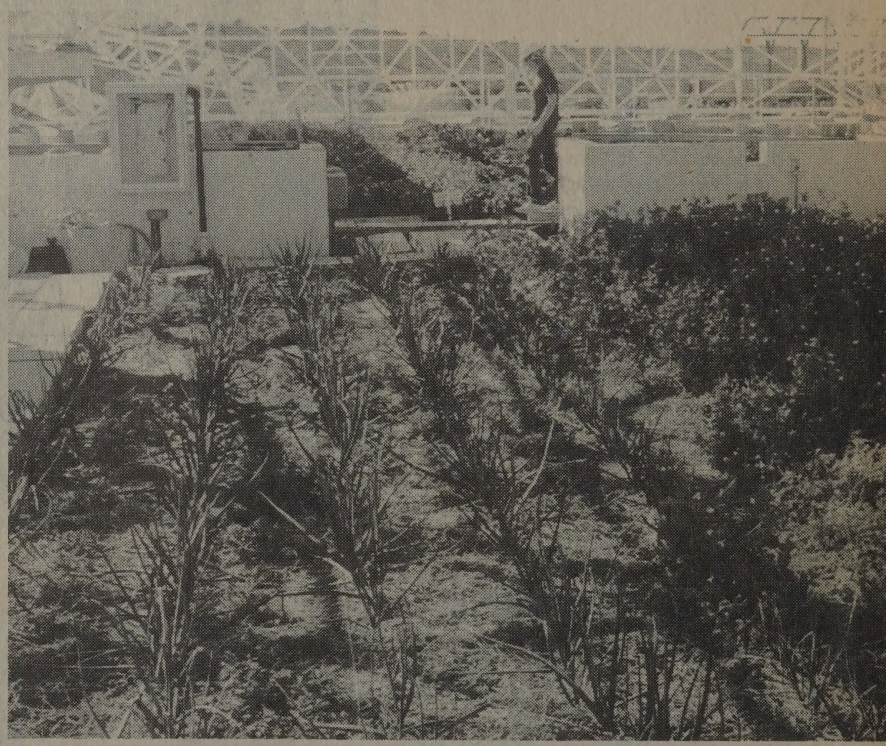


Plumbing that thinks a little

The nerve center, as the bionauts call it, is the computer room run by an artificial cortex of software and chips. Ganglions of sensors from around the Bio2 pour information into the computers. Every valve, pipe, and duct of the infrastructure is modeled in the software, a commercial product developed by artificial-intelligence expert Ed Fredkin. Usually, mechanical systems of this complexity require constant baby-sitting by engineers and operators. This one will rely on Fredkin's artificial-intelligence program to keep the technosphere automatically adjusted. Repairs and changes to the system can be forecast easily by altering the graphic model displayed, as shown here. Bio2 is probably the most intensely monitored environment ever. About a hundred compounds are monitored continuously in the air, soil, and water throughout the whole structure. Some of the potential profit-making spin-offs from the project are automatic environmental monitoring devices and techniques.

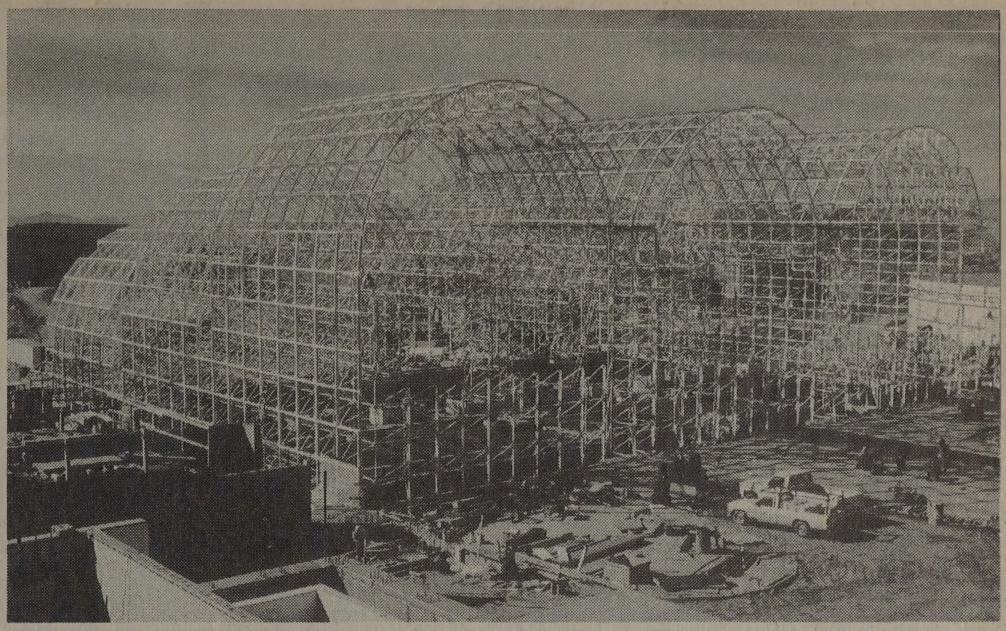
One sustainable diet

To entirely feed one person indefinitely on a backyard-sized plot requires that nutrition be maintained for both soil and human. ERL has worked out a rotation of cultivars for a small plot (to be used in Bio2) that produces a varied human diet which exceeds the minimum RDA for calories and all nutrients, except for vitamin B12. It is not boring food: oats, wheat, rice, sweet potatoes, squashes, sunflower seeds, various beans and peas, peanuts, lots of leafy greens, root crops like beets and carrots, the usual garden veggies like tomatoes, cukes, eggplant, peppers, and some fruit such as melons and strawberries.



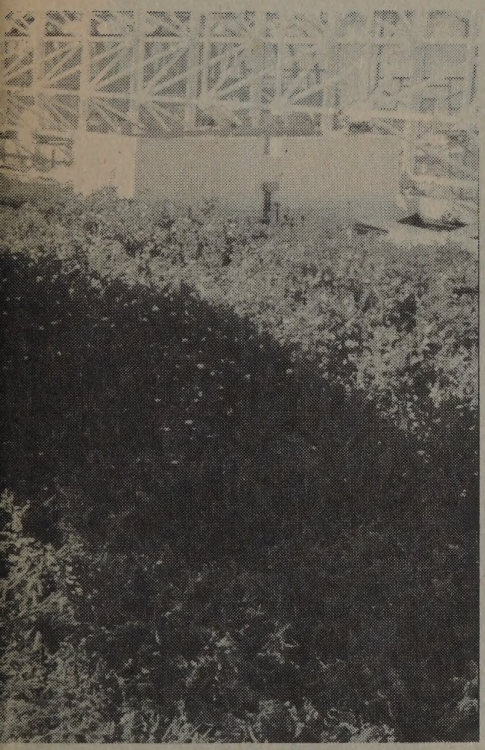
Marathon intensive cropping

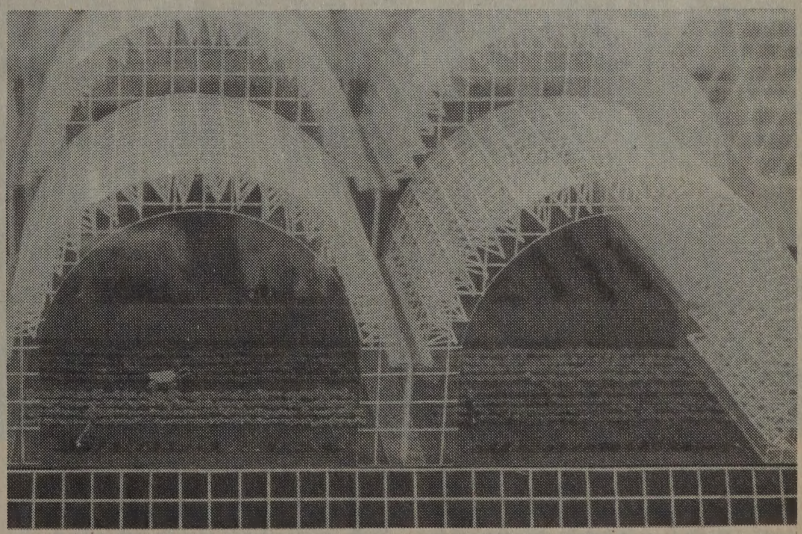
Carl Hodges, working with Environmental Research Labs (ERL), set up an elaborate and rigorous cropping schedule based on several years of research in greenhouses with a Bio2 climate, giving the day and plot in which something should be planted or harvested. In the tests, sheep manure with the nitrogen content of the feces and urine of one adult on a vegetarian diet was added to the plots to parallel the (treated) human waste that will be returned to the gardens in Bio2. ERL found that the nitrogen and carbon fertility of the soil could be sustained with intense continuous cropping as long as crop residues and human fertilizer were returned. But the research at ERL did suggest that, over time, sustainable garden soils may eventually become deficient in phosphates, although not in the time span of the Bio2 experiment.



The smallest forever garden

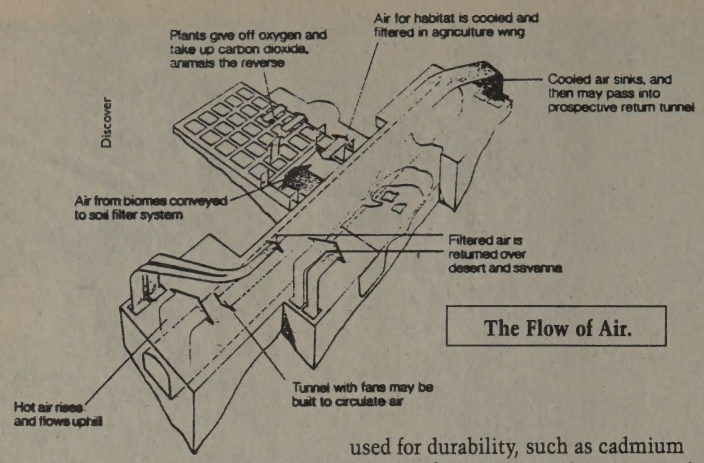
Of all the myriad parts making up Bio2, the most well-researched is the intensive agriculture area. The total area available for food crops is about 1/2 acre. Domesticated plants are bred for more sheltered climates so the entire atmosphere of the agricultural area under these domed structures will be air-conditioned to some extent. The garden's air will be dehumidified year-'round, and cooled during the summer. While water for use inside the farm will be recycled, water for the evaporation cooling towers will be drawn from wells outside. Research done by ERL has shown that it is possible to grow enough food for one person for one year on as little as 250 square meters, your basic tennis court size. And to do this year after year.





The eco-peasant

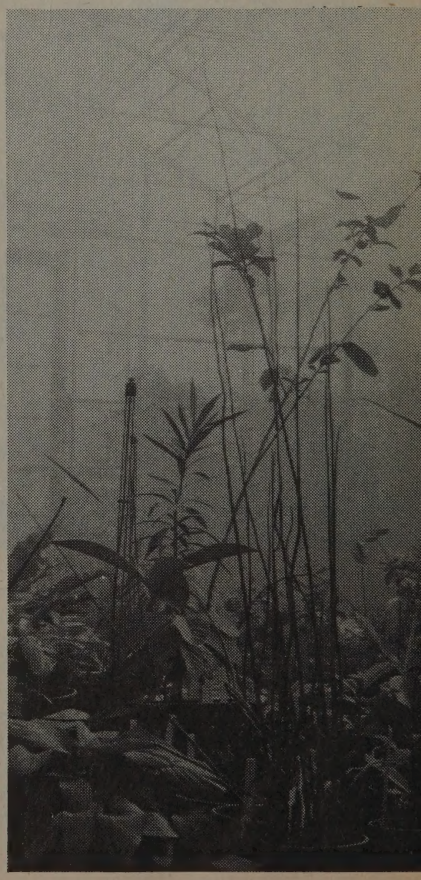
One dismaying result of ERL's studies is the estimated time needed to grow and harvest crops — four to six hours per person per day! This astounding result shifts the image of the biospherian from futuristic eco-nerd to third-world serf, toiling in the sweltering fields. Organic food is labor-intensive, especially when you are obliged to grow everything you eat. The scale is an awkward one as well — too small for a farm, too big for a garden — so adequate tools are hard to come by. The best source for ERL has been the appropriate-technology catalogs for hand tools and university research plots for power tools like tiny walk-behind combines.



The Flow of Air.

Putting the dirt into dirt

Heavy metals are a problem for biospheres. The materials and construction of Bio2 have been designed for a 50- to 100-year lifetime. Construction practices normally used for durability, such as cadmium coatings for rust prevention, copper piping, and galvanized-zinc air ducts — all high-standard specifications — were discovered to be too toxic in the rapid and short cycles of a biosphere. Even the "super" stainless steel alloy (corrosion-resistant and usually considered inert) carefully laid under the concrete beneath the ocean was coated with a plastic epoxy because of minute traces of toxic metals such as nickel, chromium, and molybdenum found from test samples. Airborne organic contaminants — the stuff of smog — released by building materials or produced by certain plants, are ingeniously removed by a Bio2 innovation called a "soil bed reactor." All the air in Bio2 is circulated through the four-foot beds of soil in the agricultural area so that the air percolates up from below ground level and off the top. This has been shown to have little effect on the plants, but to have great effect on the air. Almost all airborne solvents and organics are gobbled up by soil microorganisms. The air comes out amazingly clean. This process has a great commercial future in purifying the air of office buildings and factories. As Carl Hodges is fond of quipping, "Industry has been stuck putting its dirt into the air, when it should be putting its dirt into dirt."

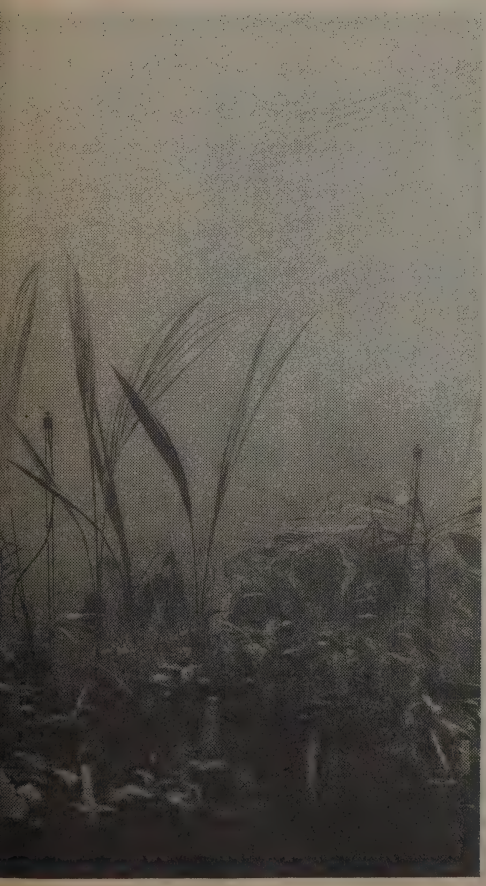


There is no garbage

Combination water purifier and aquafarm. Here's a multilevel tub system for growing rice, green compost, and fish on "waste" water. The rice is grown paddy-style in flooded beds. On the water surface a mat of azolla, a tiny flat water fern that is high in nitrogen, floats between stalks of rice. It is collected after the rice is harvested and composted for fertilizer. Under the water, tilapia fish proliferate. Tilapia, a tropical carp-like fish from the inland lakes of Africa, have an unusually high percentage of protein, reproduce rapidly, and are excellent restaurant fare. "Waste" water from the rice/fish tubs spills into water-hyacinth tubs which begin a biological clearing of the water, a job picked up with gusto by microbial bacteria adhering to a drum spun by the water movement. Since everything is recycled, there is no garbage.

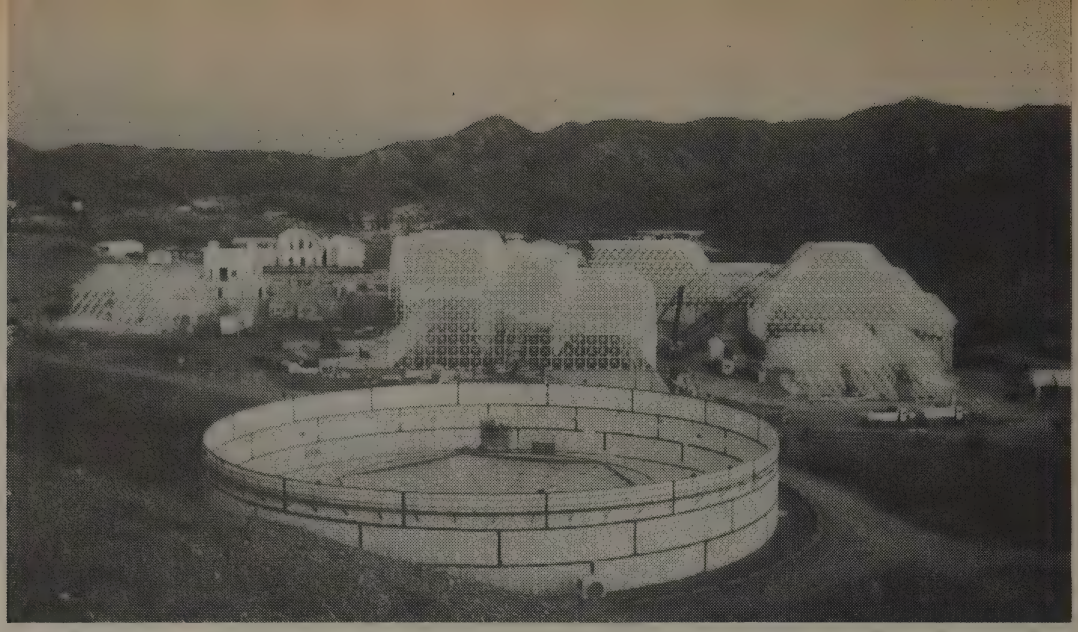
Bugs welcomed

Ripe papayas, ready for munching, hang in the rain-forest holding area. Papayas and bananas do best. Oranges languish unhappily. There's a couple of coffee trees that will produce enough beans for an occasional cup in the morning. I've worked in a lot of greenhouses, but this is the first one I've seen devoid of white flies or mealy bugs. Yet nothing is sprayed. (With a water cycle of seven days, you'd be drinking whatever you sprayed last week.) In part because of the incredible diversity of plants, insects, and microorganisms allowed to compete, pests are not a problem. In fact, Bio2 is in the business of raising insects. A large insectary was built nearby to grow plenty of beneficial critters such as ladybugs, praying mantises, and butterflies (just because they are pretty) as well as the ants, bees, termites, and other "pests" essential to support the wild parts. Without insects the whole place might fall apart.



How to make rain

Making rain for the cloud forest is a problem. The original plans optimistically called for cooling coils at the peak of the 85-foot glass roof in the jungle section which would condense the moisture into celestial rain. Early tests proved the drops to be scarce and too large and destructive, not the constant gentle mist the plants wanted. Second plan was for the rain to be pumped up into sprinklers high overhead, but that proved to be a maintenance nightmare since over a two-year period the fine-holed mist heads were sure to need unclogging or replacements. Current design has "rain" ejected from misting nozzles fitted on the ends of pipes, as in this holding area for the rain-forest plants. Drinking water is condensed off of cooling coils in the moist air — essentially air-conditioner drippings. One unexpected consequence of living in a small, materially closed system is that rather than water becoming precious, it's in virtual abundance. In about a week 100 percent of the water is recycled, cleaned by microbiological activity in wetland treatment areas of Bio2. When you use more water, it just goes around a little faster.



Walk-in lungs

In order to qualify as a materially closed system, Bio2 had to be airtight. Master engineer Bill Dempster designed the ark to leak no more than 1 percent of total air volume per year. That's one change of atmosphere per century, if he pulls it off. The glass seals are so tight, though, and the air volume is so huge that when it heats up in the Arizona summer, the increase in air pressure (remember Charles' Law?) would pop the glass panels right out like wine corks. The solution to this "small" problem is two mammoth auxiliary "lungs," one on either side of the site. Inside each tank, such as this one (capped with a lid when done), is a monster rubber pillow connected by a tunnel to the Bio2 atmosphere. A 15-ton metal plate sits on the pillow as a counterbalance. When it's cool, the plate rests on the floor. When it's hot the subtle air-pressure difference inflates the pillow elevating the metal plate. The lungs and tunnel are built high enough that biospherians can walk in them. They add about an extra acre of inside space, cool and dark, and wonderful places to play the flute.

Greenhouse meat

No, the biospherians are not vegetarians. They will raise a few animals as food, to supplement their primarily vegetarian diet. Pygmy goats provide each person one vital cup of goat's milk per day. Guineafowl, a kind of ancestral chicken that lives in jungle regions, serve as easily cared-for poultry. A coop of nesting chickens gives eggs. These Vietnamese pot-bellied pigs will also be part of the biospherian diet. Meat eating has its price — somebody inside will have to do the butchering. No butcher, no meat. Another hidden loop made visible in Bio2. Meat is not a mere luxury. Because of the climate inside Bio2, soybeans stagnate horribly. Growing sufficient vegetable protein is problematic. On the other hand the crops that do best under the glass are grain and fodder. So, the Biospherians will grow feed for animal protein, including milk.

Peter Menzel

The keystone predator

"Designing a biome is an opportunity to think like God," Peter Warshall points out with a smile. Says Tony Burgess, "You can go two ways with this. Mimic an analog of a particular environment you find in nature, or invent a synthetic based on many of them. Bio2 is definitely a synthetic ecosystem. But so is California by now." Redundancy of pathways in the foodchain is the great challenge for would-be Gods. With multiple food chains, if the sandflies die off, then there'll still be a second choice of food for the lizards. Humans are "keystone predators," acting as checks of last resort. (The 14 candidates are shown here.) Populations of plants or animals that outrun their niches can be kept in reasonable range by human "arbitration." If the ocotillo shrub takes over, the bionauts will hack it away. Adey says, "You can build synthetic ecosystems as small as you want. But the smaller you make it, the greater role human operators play because they must act out the larger forces of nature beyond the ecological community. The subsidy we get from nature is incredible."

Turbulence is not cheap, and other problems

The ecological factor most missing from Bio2 is turbulence. Sudden, unseasonal rainfall. Wind. Fire. A big tree falling over. Unexpected events. There are endless examples in ecology of how both mild and wild randomness is crucial, say, to start a forest, or recycle nutrients. Warshall says, "Everything is controlled in Bio2, but nature needs wildness, a bit of chaos. Turbulence is an expensive resource to generate artificially. But turbulence is also a mode of communication, how different species and niches inform each other. Turbulence, such as wave action, is also needed to maximize the productivity of a niche. And we ain't got any turbulence here."

Energy efficiency in Bio2? Not really. The solar panels needed to power Bio2 would have to cover 25 acres (!). Massive power is needed to insure that Bio2 doesn't fry in the Arizona summer heat. Ever hear of the greenhouse effect? To keep cool, Bio2 built its own 3.7-megawatt electric power plant fueled by natural gas. Excess power will be sold into the local grid. Beside the electricity, 10 million gallons of well water per year will feed Bio2's cooling towers. An energy-way-open system.

The time problem in Bio2 is serious. The bionauts will easily spend one-half their waking hours planting, weeding, harvesting, cleaning, processing, cooking, and cleaning up their food. Add to that the measuring and monitoring of many experiments, and then the ceaseless maintenance of a whole technosphere of computers, plumbing, wave machines, fans, electrical circuits — and you have eight slaves. Bio2 may be materially closed, informationally and energetically open, but it's time-constipated. My fear is that there's too big a hunk of the world compressed into that bottle. At least they'll have a short commute.

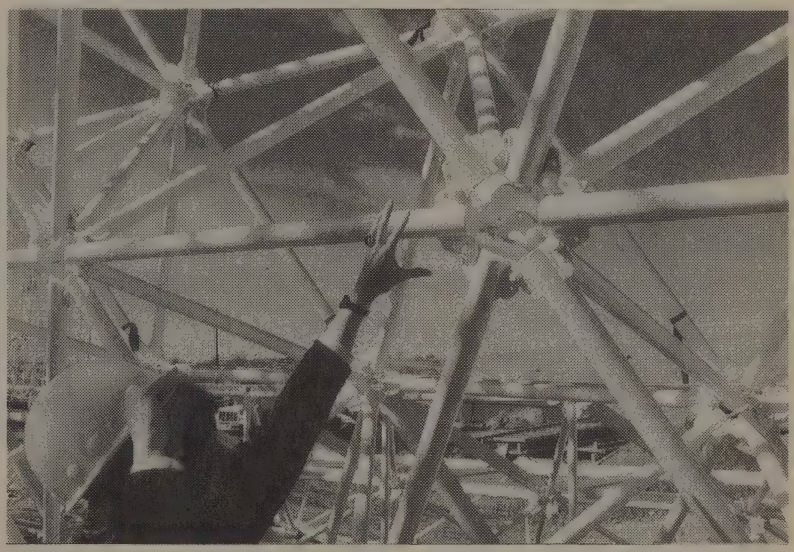
The birth of ecotech

Mark Nelson, Director of Space Applications at Bio2, got it right when he said that Bio2 was the "marriage of ecology and technics." That's the beauty of Bio2 — it's a fine example of ecotech, the symbiosis of nature and technology. But my own experience has taught how unreliable technology is day to day. If a biological system can do the job, it will be powers of ten more dependable than any technological system. As I see it, the weakness of Bio2 is that it is far too machine-dependent at the moment. Yet I endorse the course the Bio2 team is taking, because I don't see any other way. The techno-stuff will ultimately be Bio2's undoing (the plants and birds and bees will do fine), but it is a necessary scaffolding to get the ecology off the ground. Like weeds in a parking lot; the refined species come later. We don't know enough yet to invent biomes without the pumps. Using the pumps now we can try it and learn.

Learn what?

How to live within nature and with our machines.

Says Peter Warshall, "I highly recommend that everyone build a biosphere." ■



Further Reading

"Space Ecosynthesis: An Approach to the Design of Closed Ecosystems for Use in Space," by R. D. MacElroy and M. M. Averner, **NASA Technical Memorandum** -78491, June 1978. *An early report that still has much to say.*

"The Biotechnology of Space Biospheres," by Mark Nelson, **Fundamentals of Space Biology**, edited by Asashiman and Malacinski, Springer-Verlag, Berlin, 1990. *Pretty good specifics of the various technical systems in Biosphere II.*

"Biosphere II: Technical Overview of a Manned Closed Ecological System," by William F. Dempster; **SAE Technical Paper Series** #891599, Society of Automotive Engineers, Warrendale, PA, 1989. *Further technical details about the engineering achievements.*

"Sustainable Food Production For a Complete Diet," by E. Glenn, et al., presented to the Second International Symposium on Horticulture and Human Health; unpublished. *Very informative report on the research for the intensive agriculture section.*

"Bioregenerative Life Support for Space Habitation and Extended Planetary Missions," by Mark Nelson, **Space Biosphere Ventures**, Oracle, Arizona, 1989. *Gets into the few prior attempts at self-sustaining space habitats.*

"Earth's First Visitors to Mars," by Gina Maranto, in **Discover**, pp. 28-43, May 1987. *Best article in the popular press to date.*

Traces of Bygone Biospheres by Andrey Lapo, 352 pp., MIR Publishers/Synergetic Press, Oracle, Arizona, 1987. *A very Russian re-classification of life types on Earth, by a sort of grand biomystic combining Chardin's "noosphere" with Lovelock's "Gaia" and Vernadsky's geochemistry. Hard to read, but intriguing.*

Space Biospheres by Allen and Nelson, 89 pp., Synergetic Press, Oracle, Arizona, 1986. *About the theology of biospheres. Nothing very concrete.*

The Biosphere by Vladimir Vernadsky, 82 pp., Synergetic Press, Oracle, Arizona, 1986. *Written (and completely ignored) in 1926, this is a poetic-scientific foreshadowing of the Gaia notion — life and earth as one organism.*

Biospheres by Dorian Sagan, 198 pp., McGraw Hill, NY, 1990. *Not about Biosphere II. Rather, speculations on the science of biospherics — human habitats as extensions of Gaia.*

The Biosphere Catalogue, Tango Parrish Snyder, ed., 240 pp., Synergetic Press, Oracle, Arizona, 1985. *Not much new, except for a couple of good papers on the foundations of ecospheres.*

Century's End

"Fin de Siecle" is a term invented by the French in 1886 to describe the curious mixture of elation and dread present in European culture in the two decades preceding the end of the 19th century. This scholarly and wide-ranging book considers the general tendency of Western cultures to see the end of centuries as both the "end of the world" and the dawning of a bright "new age." Hillel Schwartz argues that the fin-de-siecle phenomenon in the West seems to be cumulative, at least with respect to what is emerging in anticipation of the end of the 20th century.

This book is of interest to people concerned about the future for three reasons. First, it provides a context for understanding millenial concerns that are gaining currency in all Western countries; Schwartz argues that the 20th-century fin de siecle has actually been underway for several decades. Second, it should serve to remind futurists that we are all bound by our own cultural biases; it helps to clarify and understand our bias. Finally, and rather more self-referentially, it suggests rather strongly that cultural and intellectual concern about and attention to the future has been around far longer than most of us tend to think it has. It might even be argued that modern futurism itself is in part a result of fin-de-siecle culture.

I put this book on my A list for professional futurists and people generally interested in contemporary Western culture.

—Tom Mandel

•

Talk these days of a threshold, a watershed, a decisive epoch, a hinge of history, a countdown stage, a critical transition, an evolutionary leap, a crossroads — of humankind at a cusp — is of course the old coin of apocalypse burnished for millenium's end. . . . Kuhn's theory of the abrupt process of scientific revolution is itself a paradigm for the end of our 20th and sharply accelerating century. *Fin de siecle* vertigo makes it almost impossible for us to acknowledge anything but grand and thorough transformations.

•

The New Age is post-industrial, post-economic, post-managerial, post-capitalist, post-socialist, post-political, post-modern, post-historical, and posthumous, unable quite "to define itself in terms of what it *is*, but only in terms of what it has *just-now-ceased-to-be.*"

"Even now, the idea of that Annus Mirabilis, the Year of Grace 2000, begins to affect us. We feel that if we could live to witness its advent, we should witness an immense event. We should almost expect something to happen in the Cosmos, so that we might read the great date written on the skies." [London *Spectator,* 1892]

Why? The answer enjoins a synopsis of this book. Because, over the years, Western culture has become numerate and chronocratic, sensitive to calendar time and clock time. Because we have come to identify ourselves with our centuries and to plot history by even hundreds. Because we have come to use the ends of centuries as markers not only for history but for prophecy, and the year 2000 fits exceedingly well into the historico-prophetic symmetries of the world-week. Because as other anniversaries (saints' days, commemorative holidays, even birthdays) have lost much of their numen, their spiritual power, we have transferred our rituals of loss and resolve to years' and centuries' ends.

Century's End

Hillel Schwartz, 1990; 397 pp.

$22.95 ($24.95 postpaid) from Doubleday/Cash Sales, P. O. Box 5071, Des Plaines, IL 60017-5071; 800/223-6834

A Short History of the Future

Not science fiction exactly, but a comprehensive, massively detailed script of a possible near future. What makes the scenario work is that this future was not written by a futurist, but by a professional historian. In his saga, the next one hundred years are chronicled from the perspective of a 22nd-century historian reviewing the past. Looking at the future in reverse direction is quite productive, and an intriguing tool. —Kevin Kelly

•

A representative megacorp, in some ways the prototype of them all, was the Japanese-American behemoth General Industries (GI), formed in 2003 as the result of the "supermerger" of three oil companies, two electronics companies, and two automobile manufacturers. General Industries' sales topped U.S. $1 trillion in its first full year. Within five years, it had also acquired a controlling interest in several worldwide chains of hotels, banks, hospitals, and newspapers, had invaded the petrochemicals industry on a large scale, and become a leading producer of industrial robots.

•

From time to time, some countries imagined that they could isolate themselves from the world economic order. This came to be known, ironically, as the "Cambodian" strategy, after the disastrous experiment in top-to-bottom social reconstruction mounted by the government of the soi-disant Marxist Pol Pot in 1975-78. At least a dozen small to medium-sized countries with varying ideologies and economic systems took strangely similar paths during the next seventy years. All were sooner or later recaptured by the world economy.

•

There was also a more intangible problem, equally grave, and equally chargeable in the last analysis to the magicians of capitalist technology, even if they had no direct connection with it and may have seemed entirely innocent. Simply put, this was the problem of belief: specifically, the death of belief. One might call it "credicide."

Credicide was the killing off or the dying out — it hardly matters which — of the moral, spiritual, and metaphysical values that modern civilization inherited from the immemorial past. . . .

Could modern men and women live productive, harmonious lives without shared beliefs, without even the power of belief?

Given the blessings of hindsight, we know the answer, but such knowledge would have done modern men and women no good.

•

One category of foods that made a contribution of a wholly different sort was animal food. We sometimes have difficulty imagining how people managed to eat flesh at all, but it was a staple nutrient of most of the inhabitants of the rich countries down through the twentieth century, despite steeply rising prices and the warnings of the medical community. . . .

Even after the return of general prosperity in the early twenty-first century, the consumption of animal foods continued to decline. The result was the liberation of much of the land, water, feed, and labor hitherto devoted to livestock and the raising of crops in their place.

A Short History of the Future

W. Warren Wagar, 1989; 323 pp.

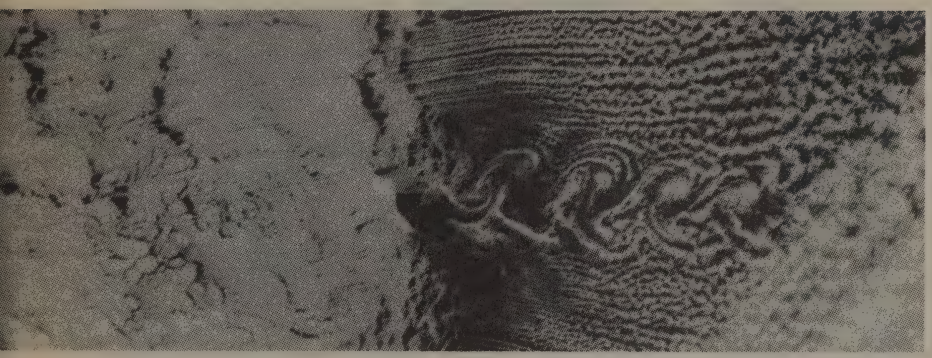
$24.95 ($26.70 postpaid) from University of Chicago Press, 11030 S. Langley Avenue, Chicago, IL 60628; 800/621-2736.

Spacious Skies

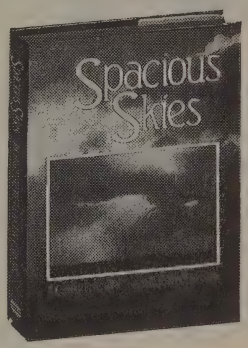
*What is great about this book is that it's **extreme**; it's written by people who are **passionate** about clouds. And it's not just identification, it's **why** the clouds look like they do and what made them that way, and what they're likely to do next, and there are a bunch of sequential photos of clouds growing and swirling around, and generally acting like clouds really act when they're not in a book. But best is that this book is of a sort that I hold in high esteem: the authors are totally into the subject, and take you with them as they learn about stuff we normally just sort of let go by without much thought. They actually chase clouds by car and aircraft, madly photographing (much in color) and note-taking. The result is probably more than you really wanted to know, but you'll likely be left truly appreciating clouds in a way you never did before. I read the handsome book cover to cover, fascinated.*

—J. Baldwin

▲ The Morning Glory. The fanciful name of this phenomenon conveys the feeling of elation which its passage arouses, but it does not begin to describe what it actually is. The nearest to it is the tidal bore on a river, which sometimes comes as a single rather sudden rise in level, but on other occasions it is followed by a series of waves of decreasing size. So far it has only been reported in Australia, although in several different places there. It is particularly interesting because it appears to travel large distances without much change in form: it is not dispersed like gravity waves.



▲ Jan Mayen is undoubtedly the most interesting oceanic island in the world for the variety of patterns it generates in the sky. Others (Madeira, Cheju Do) frequently produce as good vortex streets or (Pico in the Azores, Crozet Island 2.2) wave patterns. But none provide the almost infinite mixture of vortices, waves, trails and dark lines alone and together that we see from Jan Mayen, center.



Spacious Skies
Richard Scorer and Arjen Verkaik
1989; 192 pp.

$35 ($37.50 postpaid) from Sterling Publishing Co., Inc., 387 Park Avenue S., New York, NY 10016-8810; 800/367-9692 (in NY: 212/532-7160)

The Thousand-Yard Model

*Try this for size: Imagine a bowling ball (representing the Sun) and a peppercorn (Earth in proper scale) sitting on your table. How far apart would you separate the ball and the peppercorn to give the true scale distance? Answer: Twenty-six yards! I invite you to actually try this physically. I'll bet that when you do, you'll **feel**, rather than merely accept (gee whiz), the scale of the solar system for the first time. This nifty booklet takes you through the entire exercise all the way out to Pluto, which is correctly represented by a pinhead more than a thousand yards away. The administrative details are worked out in detail so your demonstration — with kiddies or adults — will go smoothly. (Remember, you have participants strung out over a half-mile.) It's all utterly convincing; you'll feel it in your bones. Education at its best. The author should get a prize or something.*

—J. Baldwin

•

First, collect the objects you need. They are:

Sun — any ball of diameter 8 inches.

Mercury — a pinhead, diameter .03 inch.

Venus — a peppercorn, diameter .08 inch.

Earth — a second peppercorn.

Mars — a second pinhead.

Jupiter — a chestnut, pecan, or gooseberry, diameter .9 inch.

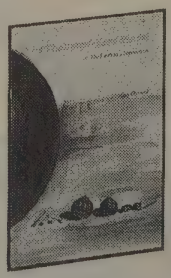
Saturn — a filbert (hazelnut) or acorn, diameter .7 inch.

Uranus — a peanut or coffeebean, diameter .3 inch.

Neptune — a second peanut or coffeebean.

Pluto — a third pinhead (smaller, if possible, since Pluto is the smallest planet).

You may suspect it is easier to search out pebbles of the right sizes. But the advantage of distinct objects such as peanuts is that their rough sizes are remembered along with them. It does not matter if the peanut is not exactly .3 inch long; nor that it is not spherical.



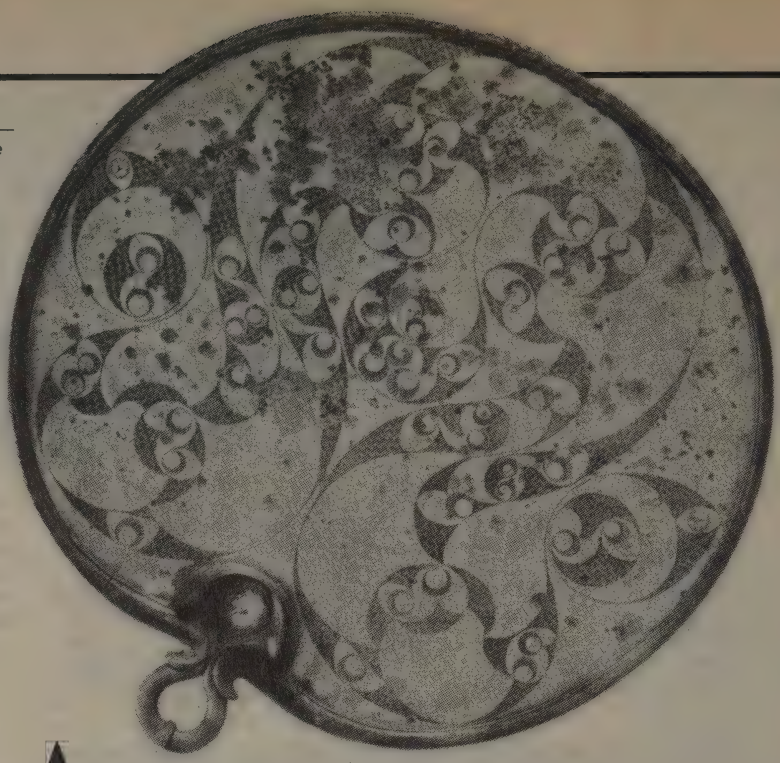
The Thousand-Yard Model
Guy Ottewell, 1989; 15 pp.

$5 postpaid from Astronomical Workshop, Furman University, Greenville, SC 29613; 803/294-2208.

Turbulent Mirror

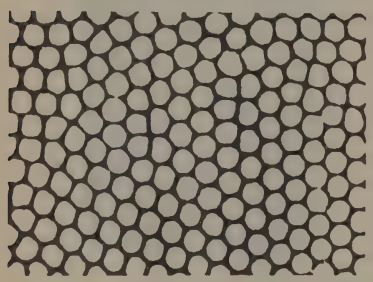
The best introduction to the role that the science of wholeness plays within the whole of science. —Kevin Kelly

Turbulent Mirror
John Briggs and F. David Peat
1989; 222 pp.
$22.50 postpaid from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

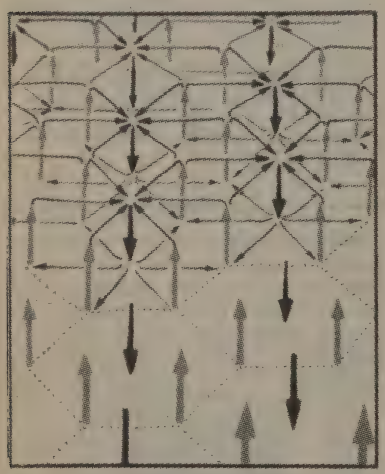


Self-similar pattern on the Desborough mirror made by Celts, probably sometime in the first century A.D.

A



B



C

(A) The hexagonal pattern of Benard cells at the bottom of a pan of heated water. (B) Scientists think the spherical shell of the atmosphere, possibly the whole atmosphere, might be a sea of seething Benard cells. (C) An aerial photograph of the Sahara Desert shows prints left by this atmospheric Benard sea. These prints of the atmosphere's convection vortices also show up in snowfields and icebergs.

•

Nonlinear equations apply specifically to discontinuous things such as explosions, sudden breaks in materials, and high winds. . . .

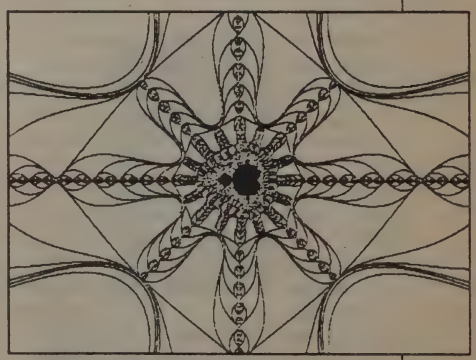
In linear equations, the solution of one equation allows the solver to generalize to other solutions; this isn't the case with nonlinear equations. Though they share certain universal qualities, nonlinear solutions tend to be stubbornly individual and peculiar. Unlike the smooth curves made by students plotting linear equations in high school math classes, plots of nonlinear equations show breaks, loops, recursions — all kinds of turbulence.

•

Calling feedback "negative" and "positive" is not a value judgement. The names simply indicate that one type of feedback regulates and the other amplifies. . . . Feedback, like nonlinearity, embodies an essential tension between order and chaos.

Aerial Press

An unorthodox group of physicists, mathematicians, and computer scientists headquartered in Santa Cruz helped set off a genuine scientific revolution in the 1980s. Now known as "the chaos cabal," Ralph Abraham, Jim Crutchfield, Rob Shaw and the others gathered around him used absurdly funky technology — like analog computers and dripping faucets — to explore the deep patterning of the universe. Aerial Press was originally founded to publish the texts on "Pictorial Mathematics" by Abraham and Chris Shaw, and has expanded to include software and videotapes as well. Besides this visually compelling "Visual Mathematics Library," other items in the catalog include Macintosh software for exploring chaos theory, color videotapes of strangely psychedelic fractal patterns revealed by computer graphics, and classic works of the chaos cabal, such as Robert Shaw's famous "The Dripping Faucet as a Model Chaotic System." —Howard Rheingold



Fractal generated with Fractools.

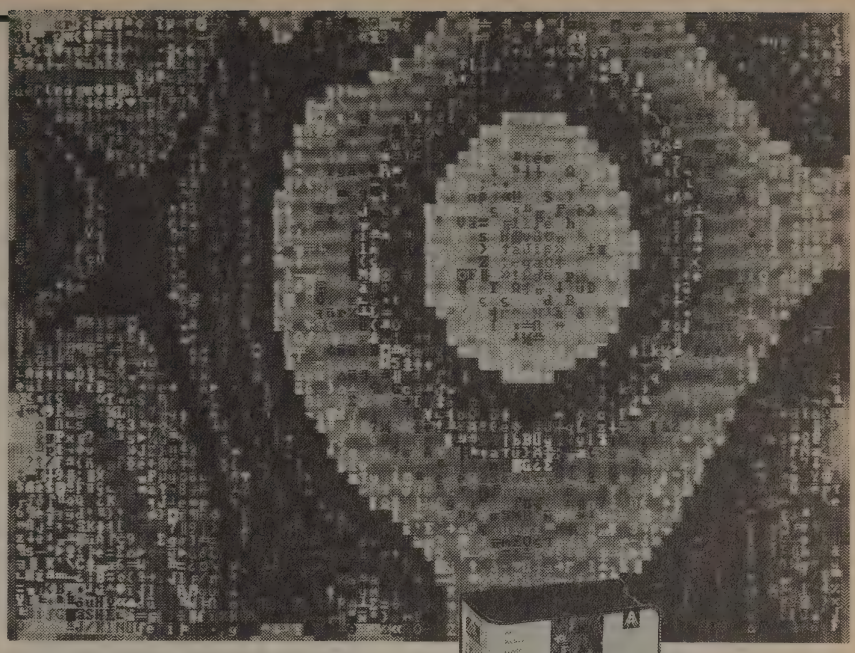
Aerial Press
Catalog **free** from P. O. Box 1360, Santa Cruz, CA 95061; 408/425-8619.

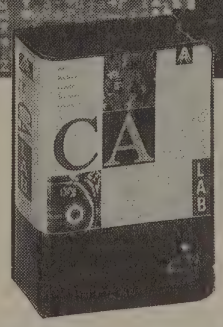
CA Lab

CA Lab comes in two main parts — a medium-resolution interactive cellular-automata (CA) program and a high-resolution analytical program. Various different sets of rules (different CA) determine changes in the state of the system as represented by color pixels. Using them is a lot like controlling a bunch of Petri dish experiments with a keyboard. I get the sense that becoming an adept would make me feel like I had entire artificial worlds to play around with. The package comes with a number of BASIC, C, Pascal, and DOS assembly routines to help you learn to write your own CA "rules." Rule programs are typically about one screen in length, so this is the kind of hacking amateurs like me can get into fairly easily.

How is it useful? (1) As an educational tool for understanding and working with cellular automata. (2) As a graphics engine. Authors Rucker and Walker believe that the most important near-term application for CA will be for graphics design. (3) As a simulation engine for certain kinds of physical systems. For instance, CA Lab includes several CAs that show how molecules disperse in a closed environment and how heat patterns spread off a heating device. (4) As an "artificial life" creator. This is what appears to excite Rucker the most. He argues that CA constitute an important bottom-up approach to understanding artificial intelligences and creatures. (Several of the rules provided results in systems that "appear" to be both alive and evolving.) (5) For sheer fun. Hacking. Playing.

A fast IBM clone (286 or higher) and a VGA monitor are recommended, although the interactive program will run on a Hercules board. I think this is a must-buy program for anyone even faintly interested in the subject. The excellent and thoroughly lucid manual is essentially a layperson's approach and introduction to CA. —Tom Mandel





The ASCII rule.

CA Lab: $59.95. Requires IBM PC. From Autodesk, Inc., 2320 Marinship Way, Sausalito, CA 94965; 800/525-2763.

Angels Fear

*In **Angels Fear**, Gregory Bateson repeatedly reframes his attempts to understand the ecological groundings of and constraints on religion and aesthetics by stepping back to view the next "level" of abstraction, then stepping again, and yet again, until he eventually backs right off the edge of the cliff of hypostatization. Humbled by the abyss preventing him from telling too much about the holy (which would be made unholy by the telling), Gregory begins telling stories about telling stories about telling too much. So don't expect an overt resolution of The Mysteries here (even with Mary Catherine Bateson's persistent attempts to gather up loose ends). To pursue your own resolution, read the stories — they communicate the sacred, instead of trying to nail it down.*

—Greg Williams

•

People say I'm cheating when I use the logic of metaphor to speak about the biological world. They call it "affirming the consequent" and seem to feel that anyone who does so should have their knuckles rapped. But really it seems to me to be the only way to talk sense about the biological world, because it is the way in which that world, the Creatura, is itself organized.

•

Any information is altered when it is incorporated in an establishment.

•

DAUGHTER: . . . In mental process information must be unevenly distributed among the interacting parts.

. . . If something like secrecy — an uneven distribution of information within a given system — is a necessary characteristic of mental systems, then we won't make the mistake of attaching value to it. You won't be tempted to make it the hero of the piece, and I won't be tempted to make it the villain. There's a parallel political issue with hierarchy, too.

As a matter of fact, I can take that a step further. What if certain kinds of secrecy do in fact function as markers for the sacred, but that's because "the sacred" is a way of coping with certain epistemological problems — maybe necessary ones?

FATHER: Are sacred secrets perhaps *designed* to be revealed?

DAUGHTER: Yes, of course!

•

DAUGHTER: You know, I was giving a seminar one evening at Lindisfarne, Colorado, and Wendell Berry was arguing that it is possible to know the material world directly. And a bat flew into the room and was swooping around in a panic, making like Kant's *Ding an sich*. So I caught it with somebody's cowboy hat and put it outside. Wendell said, "Look, that bat was really in here, a piece of the real world," and I said, "Yes, but look, the *idea* of the bat is still in here, swooping around representing alternative epistemologies, and the argument between me and Wendell too."

Angels Fear
Gregory Bateson and Mary Catherine Bateson, 1987; 224 pp.

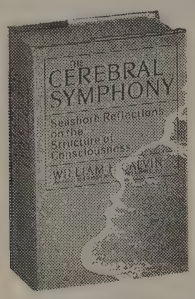
$9.95 ($11.95 postpaid) from Bantam Books, 414 E. Golf Road, Des Plaines, IL 60016; 800/223-6834

The Cerebral Symphony

Calvin presents the brain as a Darwin Machine — the same tricks that drive one-cell creatures into thinking beings in a billion years are used every day in human nervous systems to shape billions of perceptual signals into thoughts.

The author bounced around many of the ideas that ended up in this book with an online braintrust of co-thinkers — participants in the WELL's Mind conference. A simple question posed by another WELL member set off a chain of provocative speculations that continued for months: "How do I move my hand?"

This book changed the way I think about why I think. —*Howard Rheingold*



The Cerebral Symphony
William Calvin, 1990; 401 pp.

$19.95 ($21.95 postpaid) from Bantam Books, 414 E. Golf Road, Des Plaines, IL 60016; 800/223-6834 (or Whole Earth Access).

•

What controls the brain? The Mind.
What controls the Mind? The Self.
What controls the Self? Itself.

a parody related by MARVIN MINSKY

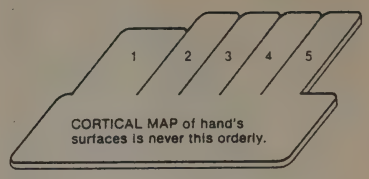
•

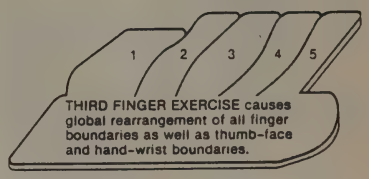
Contrary to what others might think, I'd bet that we will achieve speech and consciousness in robots sooner than we'll solve some of the more machinelike tasks such as driving a car in Boston rush-hour traffic. I will also bet that we'll solve problems such as robot locomotion not by a mathematical analysis and careful engineering of robots, but rather by shaping up a robot brain via much the same trial and error that children go through — the robot will first thrash around (as a fetus does *in utero*), then crawl, then stand, then walk, then run, and only later ride a bicycle successfully. Once we've trained such a robot (or it has trained itself by attempting to mimic what it observes in people), we will then clone the robot brain — not understanding what goes on in that copied robot brain any more than two parents understand how they've produced a child that can walk.

•

In the 1980s, we were all shocked to hear (from Michael Merzenich, Jon Kaas, Randy Nelson, and their colleagues) that somatosensory cortical maps [in the brain] were a day-to-day affair, changing size if the hand was exercised more; if a particular fingertip was regularly rubbed on something (say, a casino croupier always fingering the deck of cards with his forefinger), more cells in the somatosensory cortex would come to specialize in that finger. And conversely, the size of the average receptive-field center for a cell specializing in that finger would become smaller.

Usually when this happened, the new forefinger cells would come from cells that formerly specialized in adjacent fingers — but sometimes from cells that formerly specialized in the face! The face's connections to such versatile cells were turned down to nothing, while the forefinger's connections were enhanced — and so a "retrained worker"!





Metaphors We Live By

What if the mind isn't primarily a digital logic machine but a story-making engine fueled by metaphor? This radical view on thinking about thinking posited by Lakoff and Johnson undermines Objectivism and the outsideness of reality while opening up new possibilities for change in political and social thought and structure. This Mr.-Toad's-Wild-Ride through the countryside of the mind got me examining my own thoughts and listening to the words of others from a more open, questioning place — once I caught my breath.

—Corinne Cullen Hawkins
[Suggested by Birrell Walsh]

Metaphors We Live By
George Lakoff and Mark Johnson
1980; 242 pp.

$8.95 ($10.70 postpaid) from University of Chicago Press, 11030 S. Langley Avenue, Chicago, IL 60628; 800/621-2736
(or Whole Earth Access).

•

Many of our activities (arguing, solving problems, budgeting time, etc.) are metaphorical in nature. The metaphorical concepts that characterize those activities structure our present reality. New metaphors have the power to create a new reality. This can begin to happen when we start to comprehend our experience in terms of a metaphor, and it becomes a deeper reality when we begin to act in terms of it. If a new metaphor enters the conceptual system that we base our actions on, it will alter that conceptual system and the perceptions and actions that the system gives rise to. Much of cultural change arises from the introduction of new metaphorical concepts and the loss of old ones. For example, the Westernization of cultures throughout the world is partly a matter of introducing the TIME IS MONEY metaphor into those cultures.

•

LABOR IS A RESOURCE and TIME IS A RESOURCE are by no means universal. They emerged naturally in our culture because of the way we view work, our passion for quantification, and our obsession with purposeful ends. These metaphors highlight those aspects of labor and time that are centrally important in our culture. In doing this, they also deemphasize or hide certain aspects of labor and time. We can see what both metaphors hide by examining what they focus on.

In viewing labor as a *kind* of activity, the metaphor assumes that labor can be clearly identified and distinguished from things that are not labor. It makes the assumptions that we can tell work from play and productive activity from nonproductive activity. These assumptions obviously fail to fit reality much of the time, except perhaps on assembly lines, chain gangs, etc. The view of labor as merely a *kind* of activity, independent of who performs it, how he experiences it, and what it means in his life, hides the issues of whether the work is personally meaningful, satisfying, and humane.

The quantification of labor in terms of time, together with the view of time as serving a purposeful end, induces a notion of LEISURE TIME, which is parallel to the concept LABOR TIME. In a society like ours, where inactivity is not considered a purposeful end, a whole industry devoted to leisure activity has evolved. As a result, LEISURE TIME becomes a RESOURCE too — to be spent productively, used wisely, saved up, budgeted, wasted, lost, etc. What is hidden by the RESOURCE metaphors for labor and time is the way our concepts of LABOR and TIME affect our concept of LEISURE, turning it into something remarkably like LABOR.

The Essential Neural Net Reading List

BY MICHAEL SPENCER

THESE BOOKS ARE NOT about computers (either von Neumann or parallel). They're about computational models, networks of neuron-like "units" that learn, recognize and remember.

Quite a bit of math here, but lots of accessible ideas and information even if your algebra is rusty. A lot of catch-up material on cognitive science, neurology and linear algebra, in case you're not an expert in one (or all).

All of these books are available from M.I.T. Press (reviewed below).

Parallel Distributed Processing, by Rumelhart, McClelland et al., is still my favorite. If your linear algebra is good, you can just read it. If not, you can still get the big ideas by wading around in it. I still haven't played with the software that comes with the third volume.

Vehicles: Experiments in Synthetic Psychology, by V. Braitenberg, is lucid, clever, charming, has some nice art and develops the idea with little toy cars as a metaphor. They're almost cuddly. Mathophobes can preserve the illusion that they're not reading math with a little effort. Reviewed in *Scientific American*, in A. K. Dewdney's column (I think).

Sparse Distributed Memory, by Penti Kanerva. Hard stuff, but the idea is very clearly and carefully developed. People who grok computers but not calculus will get it. Clarifies and develops a concept that's murkily presented in *Parallel Distributed Processing*. Not a casual read, but recommended by Douglas Hofstadter (and me).

Embodiments of Mind, by Warren McCullough (new edition). McCullough asked the questions that neural nets/pdp people are trying to answer. Splendid, lucid prose. A collection of pieces, some are technical, some are accessible to any reasonably literate reader. "Why the mind is in the head" should be read by all philosophers, and "What the frog's eye tells the frog's brain" by all artists. McCullough's reputation at MIT is "more of an artist than a scientist." I can identify with that! Includes some poetry. Five stars.

Perceptrons, by M. Minsky and S. Papert (new edition). This was the book that allegedly drove neural models underground for 15 years by proving (correctly) that "perceptrons" of a certain class could not compute certain things that brains could, and speculating (wrongly) that NO "perceptron" could compute those things. Hard stuff. Unless you're a mathematician or working on a career change, borrow it from the library, read the 1969 introduction and the 1988 epilogue and return it.

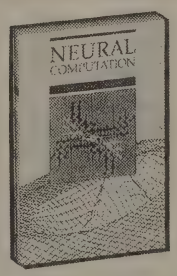
Neurocomputing, Anderson and Rosenfeld (eds). Big, expensive, mostly hard stuff. But if you're reading up on the subject, this book has all the background. The original papers (or excerpts from the original books) that are cited in the current literature. Starts with William James (1890), skips to McCullough and Pitts and Donald Hebb, then carries on up to 1987. Each of the 43 sections has an introduction by the editors which, collectively, will benefit the determined but non-technical surveyor of the subject. ■

MIT Press

Seems as if all the hard-working books on cognitive frontiers are being published by MIT Press. Their "Computer Science / Artifical Intelligence/Robotics" catalog is a one-stop way to pick up on this work early. —*Kevin Kelly*

Computer Science
Artificial Intelligence
Robotics

Free from The MIT Press, 55 Hayward Street, Cambridge, MA 02142.



Neural Computation

Terence Sejnowski, Editor

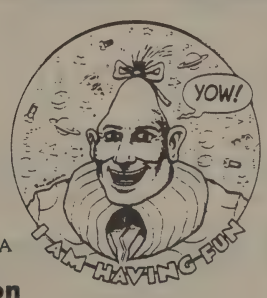
$50/year (4 issues) from MIT Press Journals, 55 Hayward Street, Cambridge, MA 02142; 617/253-2889.

Most of the astounding headlines in the next decade will be about the titillating marriage between biology and computers. One story being deeply researched now is based on observations of how our own brains are constructed — as networked tangles of dumb neurons — a kind of bio-circuit. Hence the title of ***Neural Computation*** *for this new scholarly journal chasing the field. The main concept is that "smartness" can emerge from a massive number of linked switches (neurons). Like other science frontiers, it's dauntingly technical. Unlike others, it is vigorously interdisciplinarian, an exciting crossroads between nature and machine. I scan it for the provocative whole-systems news it's turning up.* —*Kevin Kelly*

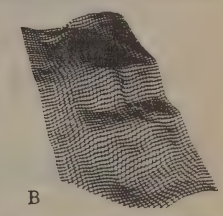
[Suggested by Lori M. Pickest]

•

What do a prototype robot (Brooks 1989) and a model for the control of behavioral choice in insects (Altman and Kien 1987a) have in common? And what do they share with a scratching cat (Shadmehr 1989)? The answer is distributed control systems that do not depend on a central command center for the execution of behavioral outputs.



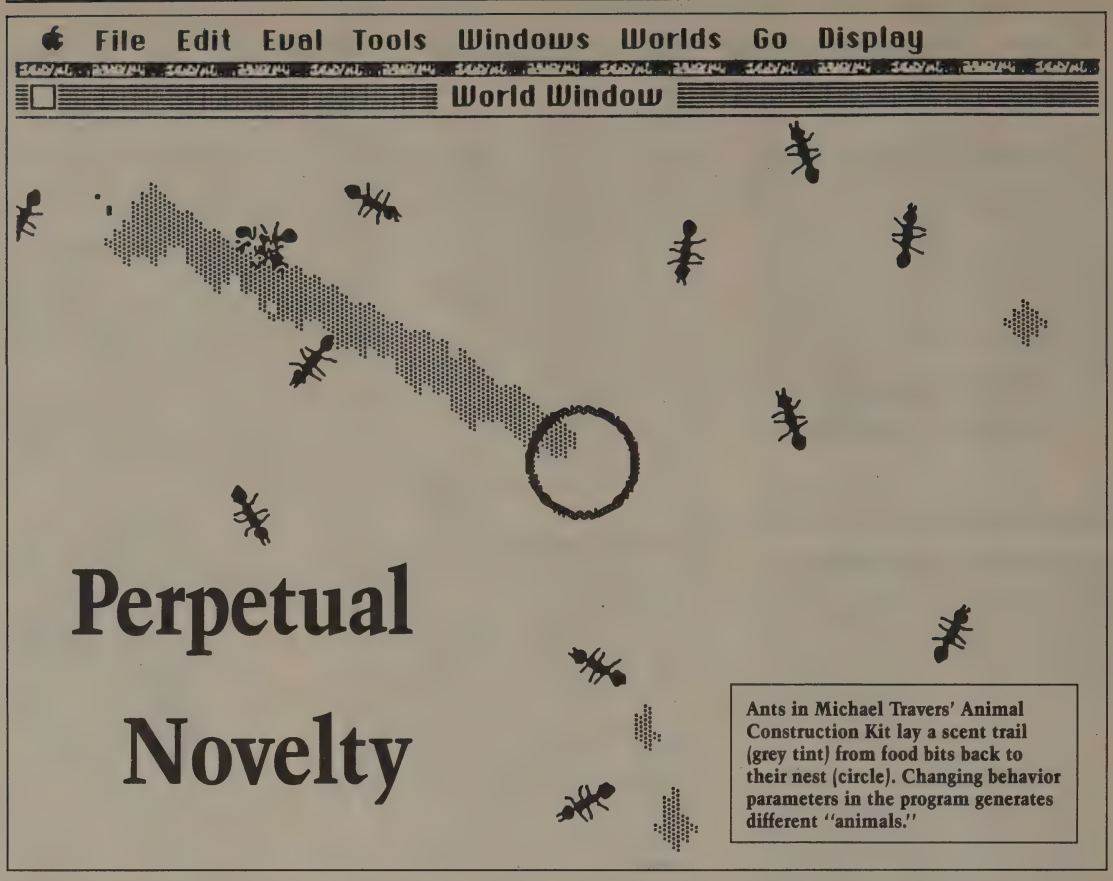
A



B

C

(A) A line drawing of a famous cartoon character, (b) a perspective view of the surface shape recovered by a shading analysis covering the face region, (c) several shaded views of the recovered surface.



Ants in Michael Travers' Animal Construction Kit lay a scent trail (grey tint) from food bits back to their nest (circle). Changing behavior parameters in the program generates different "animals."

Perpetual Novelty

Selected Notes from the Second Artificial Life Conference

BY KEVIN KELLY

"Artificial life" is a catchy name for a wholesale Enlightenment in systems understanding. I've found the few, tentative experiments reported here to be revamping my ideas on ecology, psychology, politics, economics, and biology, not to mention life (and my life) itself. Others say the same. This movement began small at the First Artificial Life Conference (see WER *#59, p. 74) and mushroomed to 200 eclectic researchers by the Second, held in Santa Fe, on February 5-9, 1990.*

LIFE ON THE EDGE OF CHAOS

Chris Langton, co-organizer of the first and second A-Life Conferences, defines artificial life as "the attempt to abstract the logical form of life in different material forms." His thesis is that life is a process, or relationship, or logic, or complexity that is not bound to a specific material manifestation. He feels that even a mild a-life enables us to study natural life by deconstructing it in a way that we cannot do in nature, either practically or morally. Langton says, "The most important thing to remember about a-life is that the part that is artificial is not the life, but the materials. Real things happen. We observe real phenomena. It is real life in an artificial medium."

Langton lists four reasons to study/create/mess around with artificial life:

1) A-life gives us a picture of nature as a whole. (And other things as a whole, I must add.)

2) We need to study a-life because it is inevitably going to be with us. Look at computer viruses as an example.

3) A-life is a better way to engineer complex software — if you can't build it, you can evolve it.

4) A-life is a means to study biological life, which resists understanding as an historical case with no comparisons, and resists (practically and morally) altering a few parameters in a coldly scientific way.

In Langton's own work on mathematically replicating cells, the most interesting patterns live at a sharp, thin line between periodic, static (thus boring) routines and unpredictable, non-repeating chaos. This gave rise to his a-life creed that "life is lived on the edge of chaos."

EVOLUTION IS PARALLEL LEARNING

What most interested me at this conference was how often participants made this equation: *evolution = learning.*

David Jefferson, from UCLA, showed the first of many ant worlds being premiered at the conference. During the week, another ant-world enthusiast quietly handed out tiny rubber ants ordered from the zany Archie McPhee mail-order catalog of rubber chickens and other novelties. Each day more and more conference participants were walking around wearing name tags crawling with carpenter ants under the plastic slip. By the end of the week, the ants had become the mascots of the conference.

Ants were independently selected by a number of researchers as ideal a-life models because they are such a handy and non-threatening example (unlike cockroaches) of simplicity-generated complexity. To cyberneticists, ants are poetic.

Jefferson created a computer-modeled world called Genesys to try out artificial evolution. His ant creatures are neural-net animals; they have simple algorithms, or rules of thumb, that tell them how to move or turn. The only resource they consume is decision (= computing) power. Their only goal in life is to find their way through a very complicated virtual maze. Since they have limited decision resources, they not only can't afford to make many wrong moves, but they can't spend too much time thinking about which move to make either. In other words, if they can figure out the few rules that get them through the maze without much thinking or error, they will succeed.

Jefferson introduced a way for the ants' algorithms to mutate, thus generating new strategies to get though the maze. He let the maze be a selection pressure. Those randomly generated ants that scored highest at getting through the maze were kept to be re-released into the maze next round. The winners were allowed to mutate slightly, and released again. This winnowing goes on for many generations.

The smartest randomly generated ant could only figure out how to get through two-thirds of the maze before running out of thinking power. But after 100 generations of evolution and sifting, a highly evolved ant could whip through the maze with a perfect score. The neat thing here is that it was not the humans but the artificial ants who developed the perfect rules of thumb.

This experiment was done with a fixed environment — the maze was the same the whole time. What would happen if you took this army of highly evolved ants and put them into a new maze? Jefferson and associates found they didn't fare well, particularly at first. After a while, the ants did learn how to go through better. But the surprising thing was that when a fresh set of randomly generated know-nothing ants was run instead of the highly evolved ants, the untrained ants reached perfect score sooner. The specialized ants weren't ever able to learn the new maze perfectly, at least in the finite number of generations run. It's the old classic lesson of the dangers of becoming over-specialized.

In ecology this is called the problem of local optimization, and it comes up often in a-life. Imagine if we were to generate a "landscape" for the adaptive abilities of an organism, played by you. The more highly adaptive you, the organism, are, the higher the elevation. This landscape will look rugged; there will be many mountains and hills because your adaptation potential depends on the outside environment. At any one time you are somewhere on this "rugged adaptive landscape" trying to climb to higher optimization. Sometimes there will be a peak that will stand high compared to the immediate area, but be lower than a really high peak someplace else. In order to get over to that other, higher peak you actually have to descend into a lower un-optimized state. It may be that you need to unravel so much of your expertise that it becomes impossible to do so, you being such an optimal organism. So you get stuck on a local high. If the environment shifts, you're doomed.

That's what happened to the specialized ants. They got caught on the local optimization of the first maze. "What this taught me," Jefferson said, "is that evolution is massively parallel learning." If you are caught not learning, you're dead. Learning means dealing with things you don't know about. It's about adapting to massive uncertainties.

How does an organism acquire generally adaptive behavior? Ahhh, that is the one of several Holy Grail questions in a-life.

LOGICAL LEGO ANIMALS

Mitchel Resnick from MIT showed his LEGO/LOGO animals. These are neat little toys made up entirely of LEGO blocks. But special LEGO blocks. Certain of the blocks have little brains. These smart LEGOs have chips built into them with metallic contacts for electrical connections. Different blocks have different functions. There are sensor blocks such as the ones that feel a wall. There's an "eye" block that detects visible light. One that sees infrared. One that notices whether it's level. Some that hear noise levels.

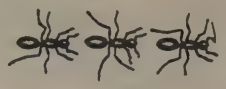
And then there are logic or cognitive blocks. There is a clock that causes a pause or delay. There is one called "AND" that gives a signal if a certain stimulus AND a certain other one are detected. There is one called "OR" that goes on if one OR the other stimulus is perceived. There's a flip-flop that says "do the opposite of whatever you did last time."

And of course there are locomotion blocks — little electric motors, gears and so on — that are off-the-shelf LEGO accessories.

Naturally what you want to do is build creatures with

all these blocks, creatures that have the tiniest, dim brain. They do things like follow the light, or run from noises, or run to noises . . . whatever you cook up. They are for kids and professors.

No you can't buy them, yet.



THE DNA COMPUTER

Theoretical biologist Stuart Kaufmann says Darwin was right as far as he went, but that Darwin had no idea that complex systems of all kinds exhibit self-organizing properties, so that the details of how selection works were left blank by its discoverer. That blank is still the biggest hole in biological science today.

Kaufmann sees "life as an *expected* emergent property of self-organized systems." Coming from someone else this might be plain mysticism, but Kaufmann is primarily a mathematician and has numbers, increasingly backed up by simulations done by others, as evidence of his ideas. He works a lot with genetic algorithms, a method which considers "the genome as a parallel-processing network, with 100,000 genes turning themselves on and off." Viewing DNA as a computer, which he does, means that flipping it around and viewing a computer as DNA, which a-lifers do, is not such a crazy notion.

Chris Langton: "Nature has more computing power than we do."

If that isn't representative of a paradigm shift, I don't know what is.

IF YOU CAN'T BUILD IT, GROW IT

"Sex is a computational hassle." —Norman Packard

Early in his talk, Danny Hillis wanted to make sure there was sex in a-life. There wasn't much before his talk and he felt sex in a-life was important; he found it sped up evolution. Hillis' conclusion came from his investigations on The Red Queen System, an ecological model based on his own Connection Machine (see *WER* #54, p. 108). This supercomputer uses 64,000 processes in parallel (versus the one or two in most computers) to simulate an interacting world. Each organism in the Red Queen System is modeled by one dedicated processor. Therefore each organism can perform its own independent interaction with other similar organisms. The combined ecology of 64,000 reciprocating organisms is what makes the Red Queen System.

It is an evolving sexual world. The organisms are "sorting networks," virtual beings whose task in life is to perform calculations. Their fitness is scored on how well they solve numerical problems. Those performing best survive to pass their rules onto the next generation. Introducing sex speeds up the process of attaining fitness. Yet Hillis discovered something that speeds up the fitness process even more: parasites.

By introducing a second kind of organism to his small worlds, Danny found that the System exhibited many more interesting levels of organization and behavior. This new organism would live off the bounty of thriving prime organisms, weakening them, but not killing them off. To thrive, prime organisms now had two tasks: to solve calculations better, and to become less attractive to parasite organisms. However, because parasites were also evolving in the system, finding new opportunities to rely on prime organisms, this parasitism became a dynamic selection pressure keeping the whole System in flux. It's from this constant race to keep in place — the lament of the Red Queen in *Alice Through the Looking Glass* that it takes all the running she can do to keep in the same spot — that the Red Queen System gets its name.

Hillis sees a-life as offering a new interpretation of biology. He says the reigning dogma is that the "natural order" specifies certain roles for organisms in nature. Oak trees should be protected because they do this or that in a forest, and oak forests should be protected because they do this or that for a certain area. But you can't separate an oak tree from the forest, or a forest from a biome. He says ecologists and perhaps environmentalists are beginning to understand that "oak tree," "oak forest" are not only fluid and continually being re-invented, but that they are almost a phantom as separate individualities. Like Richard Dawkins, of *The Selfish Gene* and *Extended Phenotype* fame, Hillis says "ideas of independent genes are illusory." An "oak tree" includes all the parasites that keep it going evolutionarily, and vice versa. It's a perspective of ever-widening circles of symbiosis.

To my mind one of the most remarkable findings from the Red Queen System is Danny's graph of his organism/parasite's rise in fitness over time. On a run of a thousand generations, their fitness mildly increases, then zooms up precipitously, then levels off for a while, then zooms rapidly again, then levels off. Understanding fitness as adaptation, this graph is a spitting image of the recent theories of punctuated equilibrium in evolution promoted by Steven Jay Gould and others. By and large, they argue, evolution proceeds at a near-equilibrium pace, which is occasionally broken by intense periods of readjustment and rapid change. Hillis' evolutions showed the same — longer periods of equilibrium punctuated by shorter, quick spurts of increased adaptation of fitness.

Theoretical biologists drool over the prospect of messing around with synthetic evolution tools like this, but Hillis has real-world applications in mind, too — flying airplanes and such. Hillis sees evolving ecologies like this able to design things humans may not have the patience or inkling to solve. "We want these systems to solve a problem we don't know how to solve, but merely know how to state." The idea is to grow solutions. Set up a system that will evolve programs that will solve the problem you have at hand. Hillis: "Rather than spending uncountable hours designing code, doing error checking, and so on, we like to spend more time making better parasites." Better parasites means faster convergence of the prime rule-making organisms toward the fitness ideal — an error-free, robust software program. "I would rather fly on a plane that was based on software built by a program like this, than on software that I wrote myself, be-

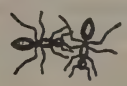
cause it would be built in an environment with thousands of adversaries who specialize in trying to find what's wrong with it. Whatever survives that has been tested ruthlessly."

THE EVOLUTION OF EVOLVABILITY

What changes the rate at which changes occur? Does the agent of change govern changes in its own makeup? The biological way of asking that is: can the mutation rate mutate?

Peter Schuster models the way proteins assemble themselves from a string of units into convoluted three-dimensional shapes. Just one difference in the order of units in the string produces a drastically different protein form. One protein might be circle-shaped, the other, one difference away, cross-shaped. Schuster made a little world in a computer where deliberate mutations were randomly introduced into the string to see how the proteins they produce would adapt to the selection tests he set up. In formal terms, he applied selection pressures to the phenotypes (proteins) created by small mutations in the genotype (string units) to see if this small world would simulate evolution and learn to adapt. He reported that increasing the mutation rate would keep increasing how well the proteins evolved until a critical "error-threshold" when further evolvability becomes difficult. This suggests that mutation rates are optimized.

What changes the change rate is not the change rate, but the system as a whole.



FAST, CHEAP, AND OUT OF CONTROL

At the first A-life Conference there was a 4-H Contest for the best a-life creatures. This time there were few entries and the prizes were given somewhat cursorily. I can't even remember who won. But I do know who should have won. Without deliberation, I would have given the blue ribbon to Rod Brooks' six-legged insect robot.

Brooks runs the robot lab at MIT. He says that rather than try to bring life into a-life, he's trying to bring a-life into life. He wants to flood the world (and beyond) with inexpensive, small, ubiquitous thinking things. He's been making robots that weigh less than 10 pounds. The six-legged walker weighs only 3.6 pounds. It's constructed of model-car parts. In three years he'd like to have a 1mm (pencil tip-size) robot. He has plans to invade the moon with a fleet of shoe-box-size robots that can be launched from throw-away rockets. It's the ant strategy: send an army of dispensable, limited agents coordinated on a task, and set them loose. Some will die, most will work, something will get done. In the time it takes to argue about one big sucker, he can have his invasion built and delivered. The motto: "Fast, Cheap, and Out of Control."

Fast, cheap, and out-of-control robots are ideal for: 1) planet exploration, 2) collection, mining, harvesting, 3) guiding, 4) remote construction, say of a lunar base. A new movement in space exploration called "microspace" favors building featherweight space vehicles that are skimpy on mass and heavy in brains. There are currently designs for "lightsats," inexpensive communication satellites no bigger than a TV set.

As an example Brooks and friends built what he cheerfully calls "The Collection Machine" (not to be confused with Danny Hillis' million-dollar Connection Machine) — a robot that collects empty soda cans in an office space at night. It's ingenious. It operates according to the society-of-mind approach to a-life robotics. The eyes of the Collection Machine spot a soda can on a desk and guide the robot until it is right in front of the can. The arm of the robot knows that it is in front of a soda can because it "looks" at its wheels and says, "Gee, my wheels aren't turning, I must be in front of a soda can." Then it reaches out to pick the can up. If it is heavier than an empty can should be, it leaves it on the desk. When it takes a can it finds its way all the way back to its station to unload it, then randomly wanders again through offices until it spots another can. (A variation, called the Confection Machine, dispenses candy to people in exchange for them opening doors for it.) Not very efficient per trip, but night after night it can amass a great collection of aluminum. During the day it sleeps.

Brooks has another small robot in mind that lives in the corner of your living room, or under the sofa, and wanders around vacuuming at random whenever you aren't home. You only notice how clean the floor is. A similar, but very tiny, insect-like robot lives in one corner of your TV screen and eats off the dust when the TV isn't on. A student of his built a cheap, bunny-sized robot that watches where you are in a room and calibrates your stereo so it is perfectly adjusted as you move around.

Brooks' most ambitious plan is to send a flock of tiny solar-powered bulldozers to the moon five years in advance of a proposed lunar base program. They can be built from off-the-shelf parts in two years, and launched completely assembled in the cheapest one-shot lunar-orbit rocket. Operating entirely by "local rules," without any communication from Earth, they will daily scrape away soil needed to level building sites. When the expedition arrives at the cleared landing, they will turn the robots off and give them a pat.

Brooks called for an infiltration of robots. He's been working on seeing how "dumb" you can make a robot and still have it do useful work. He gave the example of smart doors. For only about $10 extra you could put a chip brain in a door so that it would know you were about to go out, or it could hear from another smart door down the hall that you are coming, or it could notify the lights that you left on, and so on. If you had a building full of these smart doors talking to each other, they could help control the climate, as well as help traffic flow. If you extend that to all kinds of other apparatus we now think of as inert, putting fast, cheap intelligence into them, then we would have a colony of sentient entities, serving us, and learning how to serve us better.

His prediction for the future of a-life is that we'll have creatures living with us in mutual dependence — a-life symbiosis. They will be small, ubiquitous, hidden, and taken for granted. Their numbers will outnumber us, as

do insects. And in fact, his vision of robots is less that they will be R2D2s serving us beers, than that they will be an ecology of unnamed things just out of sight, engineered with an insect approach to problems — Fast, Cheap, and Out Of Control.

IN WILDNESS IS PRESERVATION

For this one, you had to be there. David Ackley had misinterpreted the conference's request for video demos, and instead of slap-dashedly copying some last-minute computer screens onto a cassette, he produced an informative and hilarious tape, the best talk during the whole week. He would have had a standing ovation if anyone had any strength to stand up by that time. Myself and many others pressed him to make his video available commercially. It's the one I would recommend as the best initiation for those who have no inkling of what a-life is.

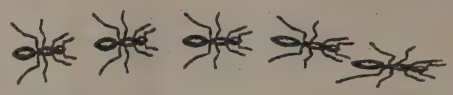
Ackley is a round guy, with a screen presence like David Letterman. In the video he invites us, the audience, to look over his shoulder as he explains his very graphic a-life world. His creatures have human faces. (No ants for him!) These humanoids run around in his world trying to acquire the usual things — resources, energy, and right answers. They bump into walls if they are not careful. They are winnowed out if they are wrong and don't get smarter. They have genes that guide their behavior, and they have mutations and crossover sex. They breed faster than rabbits. An all-nighter on Ackley's computer may take them to 300 generations.

As others have, Ackley found that his world was able to evolve amazingly fit organisms. Successful individuals would live Methuselan lifetimes (25,000 day-steps in his world), virtually immortal. These guys had the system all figured out. They knew how to get what they needed with the minimum effort. And how to stay out of trouble. Not only would individuals live long, but the populations that shared their genes would live long as well.

Noodling around with the genes of these streetwise creatures, Ackley discovered that he could make some improvements in their chromosomes that would make them even better adapted to the environment he had set up for them. He discovered a couple of ways to exploit resources that they hadn't taken up. So in perhaps the first act of virtual genetic engineering, he modified their evolved code and set them into his world. As individuals, they were superbly fitted and flourished easily, scoring higher on the fitness scale than any creature before them.

But Ackley noticed that their population numbers were always lower than the naturally evolved guys. As a group they were anemic. Although they never died out, they were always within the range of an endangered species. Ackley felt that if he ran his world for more than 300 generations, they might not last. So while the hand-crafted genes suited individuals to the max, they lacked the robustness of organically made genes, which suited the species to the max. Here, in a lab, in the home-brewed world of a midnight hacker, was the first bit of testable proof for hoary ecological wisdom: that what is best for an individual ain't necessarily best for the species.

"It's tough accepting that we can't figure out what's best in the long run," Ackley said, "but, hey, that's life!"



INADVERTENT LOW-LIFE

Eugene Spafford, computer security expert, gave a rundown on the current state of inadvertent a-life — the worms, viruses, bacteria, and other creatures on the loose in computer networks.

He started with some definitions:

Worm — propagates, or moves over networks. It may perform other actions beside replication.

Bacterium (or Rabbit) — merely replicates in known host.

Virus — inserts itself into existing program. Cannot be run on its own. Spreads by replicating.

He now has records of over 115 versions or species of computer virus. Some viruses have become quite sophisticated. At least one pair of viruses (NVIR-A and NVIR-B on the Mac) have been known to "mate," by over-writing code, to produce a strain more virulent than either. There are also cases of viruses able to detect the signature of other viruses present on the system. These aggressive viruses remove the first virus, and then insert themselves. Removal of the first virus lessens the chance of the second being detected by human predators.

Other tricks abound. In response to more wary computer operators who try to wipe them out, some viruses will fake a re-boot by dwelling in the memory. Upon discovering the presence of these memory resident viruses, the human operator will attempt to kill them and clean the system by turning the computer off. Click. Blank screen. Operator turns computer back on. Fresh screen, fresh memory, no more virus.

Wrong.

The virus, anticipating these moves, has control of the system and merely mimics the effects of turning off the memory, without letting it really happen. While pretending to be erased, the memory is still alive and holding the virus. Sort of like playing 'possum.

FRANKENSTEIN, THE METAPHOR

"The movie Frankenstein is an albatross around the neck of artificial life." —Doyne Farmer

"But the book is great. It should be required for all a-life studies." —Chris Langton

EVERY COMPUTER AN INDIVIDUAL

Russell Brand described a puzzling case he and other computer-security experts encountered, and asked the

conferees for their guess as to the agent. His thesis was that it is impossible to tell the difference between a human and a computer virus. By the end of his talk, almost everyone agreed with him.

The case involved abnormal behavior of a computer system. The system administrators noticed unofficial log-in attempts, messages left on the system, more over a period of time which were identical including a spelling mistake, then more machines infected without the spelling mistake, then an increasing number of messages left on many sites at exactly the same moment, and so on. A detective story. Who done it? A virus that misspells (on purpose to mislead?), or a human who can be more than one place at once, or a Conspiracy? The point Brand wanted to make was that they had no idea whether they were dealing with bugs or people.

The ending of the whodunnit is that it was a meme — an idea that passes itself around and infects people. In this instance it was a message that gave instructions on how to post in a "secure" area that was passed around by students, written on a piece of paper. That was why both the misspellings and the spreading simultaneous entries.

Russell Brand had some serious points, too. He made a very convincing case that you can do anything in a better way than by using viruses to do it. He took challenges from the floor (cheap way to distribute software, as a means of hi-tech warfare, etc.) and gave clever and witty replies to all of them. During this exchange, Danny Hillis asked if the proliferation of UNIX standard machines — most of the world's networked machines are UNIX-based — might be causing more viruses.

"Definitely," Brand replied. "In fact some people are deliberately staying with antiquated non-standard versions of UNIX in order to remain immune from these common infections."

"Then the problem we have with computer viruses," Danny said, "stems from the fact that all our operating systems are identical. The very thing that has made computing easy for the user — a standard system — has made it easy for viruses. There is a continuing move to standardization among machines connected by networks. So as long as formats like UNIX become a universal standard, we'll have awful problems with viruses no matter how many vaccines and quarantines you come up with. What you want in networked computing is a diversity of operating standards. You want each computer to have a slight variant of the standard, maybe one that is slowly evolving. It will still have many holes that can be exploited by viruses and so forth; it won't be any more immune to infections, but it will hardly be worth the time to try to infect just one machine."

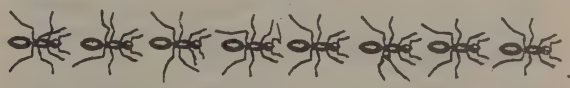
Danny made me realize that we have monocropping in computers. The idea of having a computer with an adapting operating system, one that is slightly different from all others, is both romantic and frightening. This way the computer becomes more like a pet with individual character, and (this is the scary part) with unique likes and dislikes ("Sorry, I can't stand Pagemaker; do you have Quark?"). Just when computers were becoming manageable because they were predictable, we find that ultimately predictability will be their undoing. I find myself saying "hail to unpredictability!"

NETWORK ANTS

Rob Collins introduced another ant world. Each ant is 9K in a computer neural network. There are eight ants per colony, and 4,000 colonies in his world. Colonies reproduce, not ants.

The ants roam the world looking for food, which they are supposed to bring back to their colony nest to fuel reproduction. Like the other examples at the conference, the ants "learn" over generations to better find and compete for food. However, as in real life, individual organisms (which are colonies in the insect world) have their own quirky behavior. Collins found that even though the ants learned to range far for food very early, in some a-life colonies they never learned to pick up food right outside the nest, even after 240 generations. And there was one curious colony that played with their food, stockpiling it in one corner of the world instead of inside their nests. (I don't think they lasted long.) And occasionally some of the ants dropped food into the wrong nest. (This is not uncommon among real societal insects like bees.)

Party small-talk in the year 2050: "You can't imagine what my a-life pets did today!"



THE VELOCITY OF LIFE

One thing that a-life is about that few researchers have mentioned is time compression. Artificial-life models compress evolutionary time into human scale. This, of course, accelerates the rate of change in evolution. As a-life speeds up our own progress in evolving things, it will continue to accelerate the differences in time cycles that technology has introduced into the world. Whether the slow will govern the fast, or vice versa, isn't known, but the control of velocity is control of the system.

LITTLE BEASTIES: TABOO, QUARANTINE, OR INCUBATOR?

There was a panel discussion about the implications of viruses as an a-life form. One Harold Thimbleby from Scotland outlined a serious proposal to use a worm-like mechanism to distribute software updates. "LiveWare," he calls it. The engineered selective worm is broadcast out into the world; when it finds a receptive host it infects it with an updated version of information or software. The key here is that the worm is selective, only entering those systems that have deliberately allowed it, and passing over those which do not have the needed welcome signal. It is, in effect, a self-distributing system, since the sender has no need to know who or where to send his information to.

In rebuttal, Russell Brand pointed out the dangers of such

plans and continued to claim that "for any goal viruses are the wrong mechanism." Eugene Spafford also noted that so far "no computer virus has gone extinct." Panel member biologist Hyman Harthman dryly noted that before we dismiss them out of hand we should keep in mind that viruses and related organisms form the bulk of living matter on Earth. Furthermore, he suggested, there has been a recent "theory of speciation by infection," which says that interspecies viral infections are what spurs the movement toward distinct germ lines: the crossover code from viral infections helps speed evolution. If I understood him correctly, he also said that researchers have noticed that interspecies viruses moving in the germ line are a steadily increasing phenomenon in living organisms on Earth right now.

That was the closest that anybody would come to endorsing viruses as a legitimate research area for a-life form. The same amazing thing happened at the Hackers' Conferences. Not even there would anyone publicly defend experimenting with viruses. Privately, every hacker I talked with would say that viruses were fascinating conceptually, that they were important, if not inevitable, but that they were "wrong." Here, too, scientists would confess privately to me their fascination with virus code and their desire to try something. Occasionally they would describe a design for a virus that they had in mind and would like to check out, but "of course, I wouldn't do that!" Publicly, they sat mute while the virus bashers railed. I was seeing a 21st-century taboo arise.

Steven Levy, author of *Hackers*, who was sitting with me, was getting upset. "I don't understand. Here we are at a conference on the making of a-life, and the closest example that we have of that, computer viruses, nobody will even stand up for. If they can't deal with it at this stage, how are they going to deal with full-grown artificial life?" I felt equally disgruntled. Biologically, viruses are more important to what happens on Earth than dogs or cats. I wished Lynn Margulis, the microbiologist, were around to straighten these guys out.

My question to the panel that evening: Why not construct a National Computer Virus Research Lab, an a-life incubator, where there are large networks strictly separated from the outside so that this fundamental work can be done? Russell Brand's answer: "There probably is one already. But because it's dangerous [and socially taboo I will add] it is therefore secret." The CIA has acknowledged that is has done work with viruses. If the military continues to have the monopoly on computer viral research, then the direction of a-life research is in deep trouble.

PERPETUAL NOVELTY

John Holland came up with the most sophisticated artificial world I've seen yet. It's a disembodied, pictureless world; everything happens as numbers without graphic representation. Nonetheless it's come furthest in introducing many of the parameters that ecological systems of life have. Holland calls his world Echo.

In Echo, learning and eating are the same. Echo's creatures live in a grid-land, a wide-open plane divided into squares. They eat elements. In some squares there are fountains that dish out elements abundantly. Echo's creatures head toward these fountains to consume and be energized. The elements are short bits of code. While the bits of code are food, they also serve as the genes of each individual. (These beings really are what they eat.) For instance, imagine a creature growing genes made up of *a*s, *b*s and *c*s. In order to use *a*s in its genes it needs to eat *a*s. It can get *a*s from the environment by hanging out at the *a*s fountain and competing with other organisms for the limited amounts of *a*s, or it can prey on another organism that has *a*s in it and eat those, or it can have sex with an organism with *a*s in it, swapping needed code. The *a*s, *b*s and *c*s in a critter's body are added together to form short sequences like genes. The sequence of letters evoke a particular mathematical algorithm, which determines that critter's behavior in seeking out resources.

The competition for limited resources, the algorithms that learn over time, and the mutations brought about by sex, all contribute to a wonderfully dynamic ecology in Echo. In just the few short weeks that he has been running the world, Holland has noted some interesting traits.

In Echo, as in Core Wars (a duel of two computer parasites), the shorter chromosome wins. A short chromosome costs less to reproduce, it's quicker to make, so in a battle, it wins.

Recombination (sex) keeps one a moving target against predators and parasites. You can introduce more changes into an organism, without as much randomness as simple mutation.

Holland only mentioned the next one in passing, but I believe it holds great treasures for biology if a-life can prove it: "Selected mating is the origin of niches."

The other thing he was beginning to track was the food webs produced in these worlds. The consequences of food webs are hardly understood in the wild; having some models for comparison would be galvanizing for the field. And just to see what happens, Holland would like to make eggs and seeds.

Holland's goal is to design a system that will get complexity from natural selection, rather than from "artificial" selection as in, say, Richard Dawkin's landmark program Biomorphs. In Dawkin's system, the human operator picks out which mutation to breed (much as fanciers breed pigeons or carp), and then his program evolves it. Holland insists that the system itself define the criteria to breed. Or, in other words, that the selection criteria itself would be an emergent property of that world. (The terminology can get confusing here. Real pigeons are bred with "artificial" selection, while Holland's artificial computer critters will breed with "natural" selection. Heads up!)

He says he is after "a new mathematics of perpetual novelty. It is this perpetual novelty, and not equilibrium, that equals ecology."

SEEDS OF NUMBERS

Przemyslaw Prsuinkiewicz demonstrated how mathematical rules known as Lindenmyer Systems (L-systems) could be used to model the shape of plants. Very, very simple formulas could generate forms like leaves and bushes and tree profiles. By layering several L-systems at once,

Prsuinkiewicz (I'll call him Prsu for short from now on if you don't mind) was able to mimic the leafing-out and flower stages of a wildflower. He did this in color. Then he did meadows full of them, each plant beginning as a tiny seed of numbers.

The major advance Prsu has contributed to the problem of growing an a-life form is to bring the element of time into the set of growth rules. While his earlier works superbly rendered a bouquet of flowers, or a patch of ferns, they weren't composed the way they actually grew. For example, a branch would be added to the stem, but in actuality an embryonic branch develops out of the stem as the stem itself is developing. If the stem is stunted so will be the branch hidden in it.

All growth turns out to be co-growth, just as all evolution is co-evolution. Co-growth is what the science of morphogenesis (how things grow) is all about, and why I think that a-life will finally be able to inform the incredible Looking Glass World of embryonic organisms — how does a cell know to become a hippo?

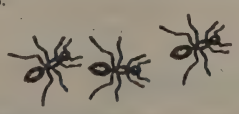
Prsu's film of growing a-life plants was riveting. There was the uncanny recognition of a time-lapse film of real plants surging upwards and out, unfolding themselves. His maturing plants and spiraling snail embryos gave off an aura that was decidedly organic. There was a grace on that screen that was neither human nor machine.

AN ANIMAL CONSTRUCTION KIT

Developed by Michael Travers at the MIT Media Lab, Agar: An Animal Construction Kit will "allow novice programmers to assemble artificial animals from simple components. These components include sensors, muscles, and computational elements. They can also include body parts such as limbs, bones, and joints. A complete animal construction kit will support the co-existence of multiple animals of different species."

As it is now, it is only an ant world. Travers runs a simulation of cooperative food-gathering using ant-like entities set into the Agar world. The human zookeeper puts out food anywhere, and the ants will try to find it. When they find food, they lay a chemical trace back to the nest so that the other ants from their nest can find the food quicker. The chemical trace "evaporates" over time, so sensitivity to the chemical trail is beneficial. The paths the ants take around obstacles are all emergent, not foreseen by program or operator.

The most important aspect of this project is that the parameters of the environment and the traits of the creatures can be easily modified to produce new creatures and new worlds.



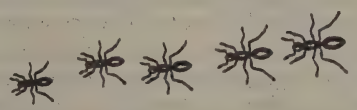
BOTTOM-UP JUGGLING

Brian Yamauchi showed a video of a juggling seeing-eye-robot-arm that relies on "bottom-up" rules. The arm's task is to bounce a hanging balloon on a paddle. This very complex behavior (seriously) is implemented by a committee of lower "agents" (in Marvin Minsky's terms) that are in charge of a motor or a sensor or another subagent. Rather than have one big brain try to figure out where the balloon is and then move the paddle to the right spot under the balloon and then hit it with the right force, these tasks are decentralized, both in location and in power.

For instance, the problem of "Where is the balloon?" is divided among simple agents, each concerned with a simple question like "Is the balloon anywhere within reach?" — an easier question to act on. The agent in charge of that question doesn't have any idea of when to hit the balloon, or even where the balloon is. Its single job is to tell the arm to back up if the balloon is not within the arm's camera vision, and to keep moving until it is. A network, or society, of very simple-minded decision-making centers like these form an organism which can exhibit remarkable agility and adaptability.

Yamauchi says, "There is no explicit communication between the behavior agents. All communication occurs through observing the effects of actions that other agents have on the external world." Keeping things local like this allows the society to evolve new behavior while avoiding the debilitating explosion in complexity that occurs with hard-wired communication processes. Keeping everybody informed about everything is how intelligence does not happen. Ignorance is sometimes bliss.

It has not been lost on certain astute observers that Yamauchi's recipe is an exact description of a market economy: there is no communication between agents, except that which occurs through observing the effects of actions (note that they see effects but not usually the actions) that other agents have on the common world. This led the Santa Fe Institute (host of the A-life Conference) to sponsor in 1988 a separate research program on "The Economy as an Adaptive Complex System."



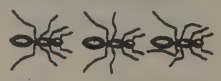
INVENTING A SPINAL CORD

This five-minute video by Michael McKenna and David Zeltzer is an entirely computer-generated animation called "Grinning Evil Death": the story of how a giant six-legged menace from outer space invades Earth and destroys a city. The villain is a loathsome metallic cockroach who wriggles over the city in a very realistic (and repulsive) cockroach way.

The creature's video movements are painted by a kind of artificial spinal cord. You tell the head where to go, and the backbone part figures out how to move the feet. So there's this gigantic chrome cockroach, and the programmers say, "walk over those buildings," and the computer/cockroach figures out how the legs go and what angle the torso should be and then paints a movie of a giant chrome cockroach climbing over buildings. When it jumps down off the other side, a simulated gravity makes its legs bounce and slip realistically.

Walking, then, has been moved from the conscious to the unconscious. Steve Strassman, who is trying to write a program for a spinal cord, has a goal of encoding enough

unconscious actions into a virtual being that one could merely give it an ordinary English-language script, and say, "Here do this." And it goes and invades a city without getting hung up on how it moves its six feet without tripping.



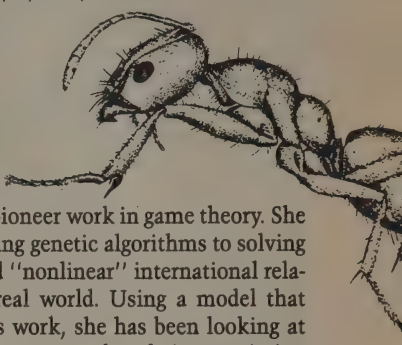
THINKING IN YOUR LEG

Belgian scientist Pattie Maes used Rod Brooks' six-legged walker as the experimental animal for teaching a creature how to walk using an agent-based, low-hierarchical system. In this case the thinking for the walking takes place near the two motors for each leg. The leg motors lift or not depending on what the other legs around them are doing. If they can get the sequence right ("Okay, hup! One, three, six, two, five, four!") walking "happens." As I understand it, setting the sequence is another job for an agent. Getting up and over obstacles, like a mound of phone directories, required adding some sensing whiskers to send ground information to the first set of legs. Since the other legs are watching the first legs, walking over obstacles happens. There is no one place in the contraption where walking is governed. There is no way for a motor, say, to determine whether it is walking or not. It knows only if it is moving its leg up and down. Sometimes when the legs are moving up and down the creature is stuck. Sometimes if everything is in harmony, the creature walks. But the parts don't know.

One of the major principles to be elucidated at the First A-life Conference was the thrilling notion that complex behavior in a variety of systems, from computer-grid worlds, to biological immunities, to synthetic ecologies, to global economies, could all be produced with what are called "local rules." Local rules guide the behavior of individual agents. These bottom-up heuristics say nothing DIRECTLY about what happens at further levels. If birds on the fly keep a certain distance between neighboring birds on the fly (a local rule), then they will exhibit a characteristic flocking behavior (a global rule), depending on what local rules they start with. Therefore, flocking (a global behavior) emerges out of local behavior. You can't get flocking by having each bird keep in mind the shape of the flock and try and do its part to keep it that way. It's too error-prone even if it was possible.

Visualizing the levels of emergent order which originate as grass-root rules and then cascade up, birthing self-organization at increasing scales of complexity, is the easy part. One can intuitively see how, with a clever choice of laws, local rules can govern global behavior. The hard part is understanding how global behavior can govern local rules.

The agent of the paddle doesn't know where the balloon is, the walking motor doesn't know if it is walking, the bird on the fly doesn't know the shape of the flock. Yet it became apparent at the Second A-life Conference that it wasn't as simple as that. The kind of perpetual novelty that John Holland talks about arises when there is a return communication between local and global. Somehow the global must control the local, difficult as it is to hit a moving target. Somehow the flock can aim itself to a destination, and sometimes over years, the flock will change its destination, or even, by evolution, what the aim of flocking is. All these changes entail the locally elected global power governing the local. Start with simple rules, get complex behavior — easy part. Get complex behavior to govern simple rules — very hard part. This is an important and final loop in an extremely recursive circuit. How this loop is kept flexible, rather than an ever-tightening noose, is, I bet, the theme of the Third A-life Conference.



NON-LINEAR GAMES

Stephanie Forrest does pioneer work in game theory. She has recently been applying genetic algorithms to solving arms-race problems, and "nonlinear" international relations, i.e. the chaotic real world. Using a model that parallels John Holland's work, she has been looking at how simulated countries can evolve their negotiation strategies for mutual benefit. In Holland's a-life world each organism determines its strength of defense, offense, reproduction; in Forrest's nonlinear international world, each country determines a similar three priorities: guns, butter, re-investment. Her initial results imply that in three-country worlds, the strongest position arises when the two weakest countries join as allies.

What is of interest here is that the allegiances are formed without prior prompting. It is an emergent property of a complex system. Forrest's earlier work with negotiating strategies (The Prisoner's Dilemma) and her current work point to "how cooperative behavior can arise in populations of autonomous self-interested agents in which there is no central authority." In worlds that seem to be propelled by Darwinian-described competition, how does cooperation ever arise? Richard Dawkin's explanation is that selfish genes make altruistic organisms. Forrest is suggesting other ways — that cooperation is a positive-feedback trait of adapting systems.

Remarkably it is the ants, again, who have some answers. Other than a-life fans and their ant worlds, the only other set of people seriously investigating the question of emergent cooperation are the real-ant fans — the sociobiologists. Ants exhibit rule-breaking altruism where one would not expect it — in pretty dumb and savage little beasties. They have systematic cooperation despite individual little-mindedness, and this is of interest to political scientists as we try to restructure a global economy. The Book of Proverbs (6:6) speaks truthfully when it says, "Consider the ant's ways and be wise!" Ants are, it appears now, the world's leading experts in nonlinear international relations. (See review, *The Ants*, p. 30.)

THE GENIUS OF RODENTS

John Nagle contemplated squirrels. Taking a cue from Hans Moravec at the CMU Robotics Lab, who suggests that current computers have an intelligence level of a snail, Nagle argued for aiming at the realistic goal of generating the intelligence of a squirrel. Rodents have about 1 gram of brain mass, which Nagle says is equi-

valent to a computer running somewhere between 100 and 1000 MIPS (millions of instructions per second). That level is not as impossible as human-level AI, but far more useful than the ant-level intelligence of your average Macintosh.

Squirrel-level intelligence will get us automatic character animation. Specifically, Nagle proposed a goal of reaching a level so that an a-life "squirrel does the right thing over periods of less than one minute." He said the hard things that a-life and AI folks tend to "abstract out" in order not to do, are actually the most important things. Going along with the Moravec graph of increase in computer power as a function of time, Nagle said we'll have squirrel-level artificial intelligence by the year 2000.

A young woman (one of the few present) stood up at the microphone at question time and told Nagle that he was full of it. She said that almost all the scientists dreaming about a-life any time soon were on cloud nine, that none of them had any idea of how complicated real biology was, that Moravec was out to lunch, that the work on retinas that he has been basing his projections on is shoddy, that she is a neurobiologist herself who happens to be studying the retina and Moravec hasn't got a clue to how computationally sophisticated just the eye is, that computer scientists like him underestimate the power of animal brains to the point of silliness, that equating MIPS with intelligence is one good example of how crippled the whole a-life movement is, and would he care to comment?

Nagle shifted uneasily and said he had a plane to catch (he did) and maybe someone else could answer her (they didn't).

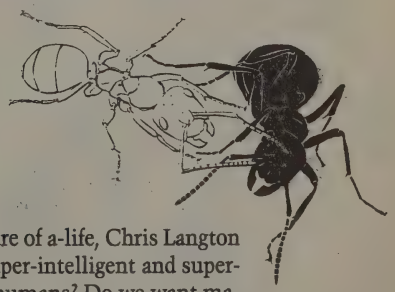
ENTERTAINMENT FOR MACHINES

On the last day of the conference Mark Pauline got his shock-wave cannon working. A solenoid on the cannon had broken on the plane flight, so during the a-life show-and-tell evening, the crowds had to be content to watch videos of past Survival Research Laboratories (SRL) spectacles. They were awesome and disturbing. One avant-garde video was a stark "documentary" of elaborate dinosaur-like machines involved in ceremonial rituals of sacrificing other machines to the machine god. These are not sleek Star-Trek machines, but rusty, smoldering, smoky, greasy, vibrating, mechanical monsters. They have gears and pistons, and sharp edges. They cut up or burn fellow machines with rotating propellers and grinding wheels. Their performances are modern-day Roman circuses of mechanical gladiators staged under industrial decay, searchlights, screeching loudspeakers, the crackle of fire, and the smell of diesel oil.

The idea is to do the shows with as little publicity or official approval as possible, have the audience get as close as they dare, and make the machines as fast, cheap and out-of-control as one can. For instance, take the Flame Thrower on Wheels. It used a Mack-truck V8 engine to run a huge blower that sucked up kerosene from a 55-gallon drum and ignited it with a carbon arc, spewing out a tongue of vicious orange flame a hundred feet easily. It was controlled by a little model-airplane joystick. Or take Pauline's description of his newest pet which he showed clips of: "This completed device is based on electromagnetic rail gun technology. Rather than firing a projectile at high speeds for kinetic impact effects or other droll, destructive military objectives, this device employs similar capacitor energy-storage units to liquefy a metal bar and magnetically eject the molten blob at about 200 mph. It appears to the eye as a comet-like beam that fragments on impact, tending to set fire to any nearby combustibles." As Pauline added. "This machine is SRL's answer to George Bush's call for a thousand points of light."

Nothing as kinetic was planned for the A-life Conference. A mere shock-wave cannon would do. A tube about five feet long is chained to an an electric hoist near the speaker's podium, and pointed over the heads of the 200 scientists. Hoses run to a tank of acetylene on the floor. When we see the blue warning light, we plug our ears. *Booooooooooom.* A terrific crack blasts the hall, blowing off all the papers, notes and hand-outs on the tables of the participants in the back row. The scientists scatter. A rain of dust and plaster bits showers down. The blue light goes on again. *Booooooooooom.* I am standing behind the cannon and actually see a wave go across the conference hall and hit the back balcony wall, where it shatters the plaster stucco. People are ducking now. Another blue light. Again, *Booooooooooom.* It's actually less a noise than a thump to the lungs. Pauline is enjoying it, an impassive face with a hint of a smile.

"Machines have something to say to us," Pauline says afterward. "When I start designing an SRL show, I ask myself, what do these machines want to do? You know, I see this old backhoe that some red-neck is running everyday, maybe digging ditches out in the sun for the phone company. That backhoe is bored. It's ailing and dirty. We're coming along and asking it what it wants to do. Maybe it wants to be in our show. We go around and rescue machines that have been abandoned, or even dismembered. So we have to ask ourselves, what do these machines really want to do, what do they want to wear? So we think about color coordination, and lighting. Our shows are not for humans, they are for machines. We don't ask how machines are going to entertain us. We ask, how can we entertain them? That's what our shows are, entertainment for machines."



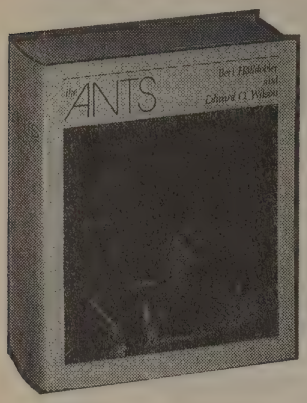
ARTIFICIAL HUMANS, BIOLOGICAL MACHINES

In the closing panel on the future of a-life, Chris Langton asked, "When machines are super-intelligent and super-efficient, what is the niche of humans? Do we want machines, or do we want us?" Pauline responded, "Humans will accumulate artificial abilities, while machines accumulate biological intelligence. This will make the confrontation even less morally clear."

Somebody else on the panel: "You know Rod Brook's smart doors? Eventually we won't say to the door, 'open'; we'll have to say, 'open, please.'" ■

The Ants

I believe this is the deepest book of knowledge ever printed. In 732 exquisite pages, it contains almost all that is known about ants. It will feed your mind for a lifetime. The biology of ants is about the history of societies and institutions, and about the future of cities and computers.
—Kevin Kelly



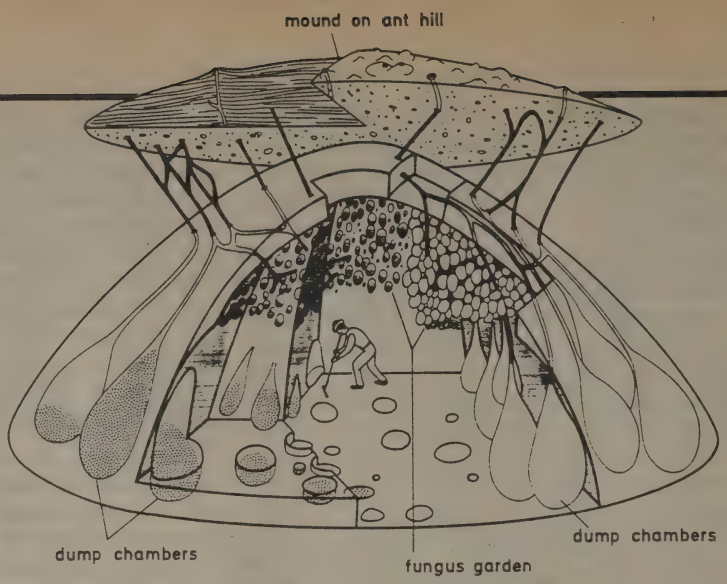
The Ants
Bert Holldobler
and Edward O. Wilson
1990; 732 pp.

$65 ($67 postpaid) from Harvard University Press, 79 Garden Street, Cambridge, MA 02138; 617/495-2480.

•

Pharaoh's ants (*Monomorium pharaonis*) are worldwide household pests. Their vast, multi-queened colonies thrive in wall spaces and detritus. In hospitals they often visit soiled bandages and track pathogenic microbes onto clean dressings and food. A notorious colony occupied the entire Biological Laboratories of Harvard University during the 1960s and 1970s. An extermination campaign was finally undertaken when workers were discovered carrying radioactive chemicals from culture dishes into the surrounding walls. (The incident was made the basis of the melodramatic scientific novel *Spirals,* by William Patrick, Houghton Mifflin, Boston, 1983.)

Ants are resistant to hard radiation. Colonies exposed to intense cesium-based irradiation in a French forest suffered no evident decline or change in behavior during 11 months, even when some of the surrounding plants were dying or losing their leaves. At least some ant species are also highly resistant to industrial pollution. Near a nitrogen plant in Poland, populations of *Myrmica ruginodis* and *Lasius niger* remained robust after other invertebrates became scarce. They actually reduced the concentration of the nitrate, apparently by stimulation of microorganisms that bind the pollutant.



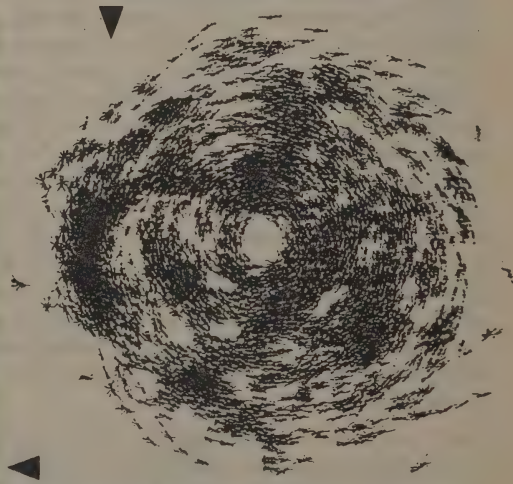
▲ **The plan of a mature nest of the leafcutter ant *Atta vollenweideri*, based on actual excavations. The upper mound of soil was brought to the surface by the ants during the digging of the nest. The dump chambers contain exhausted substrate. The fungus is cultured in the fungus garden chambers.**

•

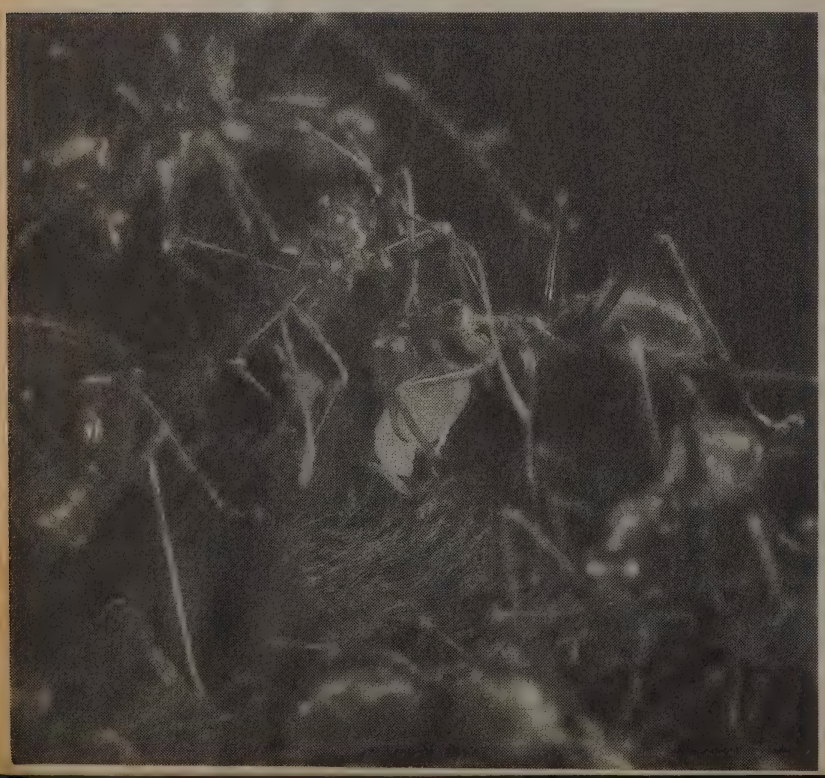
African habitats are often visited by driver ants (*Dorylus* spp.), single colonies of which occasionally contain more than 20 million workers. And the driver ant case is far from the ultimate. A "supercolony" of the ant *Formica yessensis* on the Ishikari Coast of Hokkaido was reported to be composed of 306 million workers and 1,080,000 queens living in 45,000 interconnected nests across a territory of 2.7 square kilometers.

A circular mill of the army ant *Labidus praedator*. This group was cut off from the rest of their colony by rain. The workers were so strongly attracted to each other that none developed enough centrifugal direction to lead the others out of the mill. After a day and a half, all were dead.

▼



◄ **The final stage of nest construction by the weaver ant *Oecophylla*. A worker of the Asian weaver ant *O. smaragdina* holds a last-instar larva between her mandibles and moves it back and forth between the edges of two leaves. The larva, responding to tactile signals from the ant's antennae, releases silk from its silk glands. In this way it serves as a living shuttle responsible for the unique properties of the nest.**



The Cuckoo's Egg

Second day on the job, the co-manager of the computer services at Lawrence Berkeley Laboratories (a de-funded astronomer named Clifford Stoll) noticed a seventy-five-cent accounting discrepancy. Soon, he uncovered the existence of an intensely savvy and diligent computer cracker who kept breaking in (through research computer networks such as the ArpaNet) to military computers around the country. Using only his access to the computer, Stoll bulldoggedly tracked the crackers down — battling indifference and obfuscation from the FBI and NSA, hostility from his Berkeleyite peers, and his own lack of money, time and certainty. One hilarious scene has him borrowing dozens of computer printers, wiring them to the incoming phone lines, and sleeping between them so that the racket from an incoming call would wake him and he could trap the hacker red-handed. Eventually, the hacker turned out to be the West German "Hannover Hacker."

If this were only an engrossing story, it would be worth recommending. But Stoll uses his story to talk about computer systems as a common good, a shared resource that gets its value from the integrity of the people who share it. He also makes the intricacies of linked computer networks more understandable than any other writer has managed yet. Far more than any computer security analysis or sociological treatise would, this story reveals the human culture of current-day computing, and the hidden, bureaucratic culture of day-to-day espionage.

—Art Kleiner

•

Every ten minutes, the hacker issued the command, "who," to list everyone logged onto the computer. Apparently, he worried that someone might see him connected, or might be watching. Later, he searched for any changes in the operating system — had I modified the daemons to record his session, as I'd first planned to do, he would surely have discovered it. I felt like a kid playing hide-and-seek, when the seeker passes within inches of his hiding place.

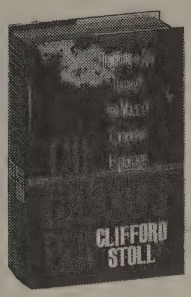
Within the first hour, he wrote a program to scan everyone's mail messages for any mention of his activity. He searched for the word, "hacker," and "security." . . .

He kills any jobs that he thinks might monitor him. He opens my mail, checking to see if anyone's written about hackers. Wayne was right: if you stay in the open, he'll know you're watching. From now on, we'd have to be subtle and invisible.

•

Suppose you walked along a city street trying to force doors open. How long would it take before someone called the cops? Five houses? Ten?

Well, with the help of the hacker, I knew the answer. On the computer networks, you can bang on forty doors before someone notices. With this kind of guard our computers are sitting ducks. Almost nobody's watching for intruders trying to break in.



The Cuckoo's Egg
Clifford Stoll, 1989; 326 pp.

$19.95 ($21.95 postpaid) from Doubleday/Cash Sales, P. O. Box 5071, Des Plaines, IL 60017-5071; 800/223-6834
(or Whole Earth Access).

Computer Virus Books

We are witnessing an escalating computer-virus arms race — virus, vaccine, counter-virus — that has created a whole anti-virus industry: software programs, consultants, and many books. The most reliable intelligence from this conflict has been collected in ***Computer Viruses, Worms, Data Diddlers, Killer Programs, and Other Threats to Your System****, by John McAfee. When corporations in Silicon Valley discover a virus, they call McAfee, who arrives in a specially outfitted "virus-buster van." His book, written for the computer-security trade, gives a comprehensive dossier of all known viral strains, past and present (up to fall 1989), and much insider scuttlebutt that is very readable for the lay user.*

On the other hand, ***Virus!*** *by Allan Lundell is a wild, irresponsible, and highly speculative book that dramatically exaggerates the subtle attributes of computer viruses, and therefore is the more revealing one, in a vaudeville way. It tackles the question, "What does a computer virus* ***mean?****" Treat what is said as well-founded rumor. There's probably more in these two books than most want to know, but for both computer crime- and computer life-watchers, the trail begins here.*

—Kevin Kelly

•

Those arch virus spreaders who belong to the Chaos Computer Club of West Germany tampered with National Aeronautics and Space Administration files over a five-month period before they were found out. They claim to have left behind virus programs that they can activate at will. NASA's experts have dismissed these claims, but without convincing those who have a healthy respect for the Club's technical prowess. There is no way to be absolutely certain that there are not more hidden viruses in various NASA systems or, indeed, in the systems of the FBI, CIA, or IRS, which we would expect to be secure but which have been already penetrated by hackers.

•

Computer viruses could begin to change the political balance of power in a remarkable way. They represent the first weapons that could be deployed at both low cost and comparatively little risk by individuals, groups, or small countries against big business or the major powers. A hostile Third World government can readily acquire the potential ability to cause serious damage to computer installations in Moscow, Washington, or any other seat of political, military, or economic power.

—Computer Viruses (etc.)

•

White blood cells and macrophages travel through our veins and arteries looking for "unauthorized" visitors. In computers, roving "checker programs" could travel paths leading to all important parts of a system, disabling unauthorized or unrecognized programs, peripherals, terminals, and the like. *—Virus!*

Computer Viruses, Worms, Data Diddlers, Killer Programs, and Other Threats to Your System
John McAfee and Colin Haynes
1989; 235 pp.

$16.95 ($18.45 postpaid) from St. Martin's Press/Cash Sales, 175 5th Avenue, New York, NY 10010; 800/221-7945
(or Whole Earth Access).

Virus!
(The Secret World of Computer Invaders)
Allan Lundell, 1989; 189 pp.

$9.75 ($10.75 postpaid) from Contemporary Books, 180 N. Michigan Avenue, Chicago, IL 60601; 312/782-9181.

DNA decoder (above), DNA synthesizer (right).

I spent a day recently at a biotechnology trade show, snooping around the aisles of plumbing and lab gear to see how close we are to having gene equipment that would work in a suburban garage. I was looking for off-the-shelf components that could be assembled by a dedicated individual into a lab for homebrewed DNA. I was surprised by how close it has come. While most of the equipment for biotechnology is either delicate but cumbersome laboratory research instruments, or massive industrial/chemical plumbing for production purposes, there are a couple of items that have miniaturized the research methods into a suggestive desktop space.

The leader in self-contained DNA coding gear is Applied Biosystems. Their star contraption is a table-top box linked to a Macintosh computer that will assemble a short string of DNA from the order that you type into the Mac. The unit generates the DNA sequence from the same four amino acids that cellular DNA does. In this case the amino acids are provided in small bottles in the front of the box, along with bottles of solvent to drive the process. The DNA is "outputted" into a tiny capillary tube. While the machine is 99.8% accurate in what it constructs, the major (and it is major) drawback is that it can assemble sequences that are no more than 180 units long, which would make one short gene, at most. (Genes, like words, vary in length.) Since human genes come in the order of about one billion units, there is a way to go in improvements. On the other hand, since the alteration of even one gene can make a big difference in a living organism (many congenital diseases are due to a single

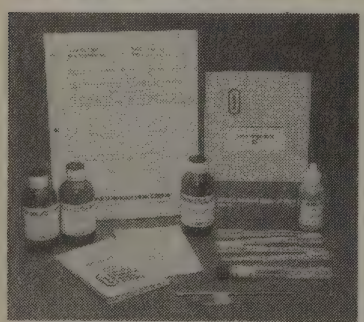
gene), there is still power in being able to rewrite a couple of hundred units.

A complementary box made by Applied Biosystems works in reverse. Rather than going from code to DNA, it goes from DNA to code. It takes a bit of existing DNA and "reads" its sequence out as a display on the computer — ATTCGGACA, etc., for instance. Not only can this verify a sequence one builds, but its main purpose is to unravel the genetic code encrypted in all living things. It too is severely limited in the amount of DNA it can handle at one time. But the task of deciphering chromosomes that are 5 million genes long would be a bummer without it. The two machines work as a pair. Both together would fit onto a kitchen countertop.

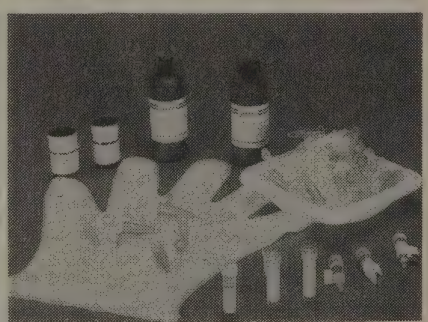
These units by themselves are not enough to do biotechnology research. Sundry other hi-tech items, as well as low-tech ones like incubators, cold rooms and basic labware, are essential. But these two systems are the heart of the hard work; they automate what was tedious and unpredictable toil just a few years ago. I'd guess that true basement biotechnology is still at least a decade away, if only because of the price ($50,000 for each of these machines alone) and the expertise (Ph.D) needed to get them going. —Kevin Kelly

Information from:
Applied Biosystems, Inc., 850 Lincoln Center Drive, Foster City, CA 94404.

Cabisco Biotechnology DNA Kits



21-1170J Gene Regulation BioKit



21-1150J DNA Restriction Analysis Kit

Gene Regulation BioKit[3]. For a class of 30. Students observe repression and induction of the galactosidase gene. By providing various combinations of sugars to *Escherichia coli*, students "turn on" and "turn off" the lac operon. Test tubes, test tube racks, and an incubator are needed but not provided. Simple procedure can be completed in one hour. *Please specify use date on order.*

Escherichia coli
Inoculating Needle
Lactose
Lactose and Glucose
O-Nitrophenyl-beta-D-galactopyranoside
Glucose
Incomplete Medium
Pasteur Pipets
Labels
Student Guides
Teacher's Manual

21-1170J Per kit. . $54.29

*Perfect for high-school students: a better way than sex to fool around with genes. Biotechnology techniques are routine enough that they can be distilled into foolproof methods to be used in science classes. Cabisco sells very explicit kits that give hands-on experience in this mysterious world. They sell a lab manual called **DNA Science: A First Laboratory Course in Recombinant-DNA Technology** which is exactly what the title says. Their catalog features all the other fundamental paraphernalia and concoctions you'd need for experimenting with DNA. Please follow directions.*

—Kevin Kelly

Cabisco Biotechnology

Small catalog **free;**
large catalog **$15.65** from Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215; 800/334-5551 (in NC: 800/632-1231).

The Laws of Life

American press coverage of biotechnology has gotten downright predictable. First there's the promise of great benefits for humanity from a venture-capitalist entrepreneur. Next the superficial description of something far too tiny to see, but involving man remaking nature using enzymes, delivered by a man in a white coat. And finally for balance, a brief statement to the contrary by Jeremy Rifkin, with optional mention of his latest lawsuit.

For a revealing alternative, try this conference record, published by a Swedish journal (in English). It spins the globe around and plunks down the consequences of all this gene-splicing wonderment in the Third World. To the conference participants who live there, the impending results ain't pretty. In fact to them it looks a lot like a nastier green revolution. Third World public-interest groups (referred to everywhere else but in the U.S. as NGOs — for Non-Governmental Organizations) are discovering that whether the issue is pesticides or safe baby food, increasingly they are dealing with the same few giant corporations. They're referred to here as the life sciences industry, or the genetic supply industry, and they frequently control markets and provide products for energy, medicine, and food and agriculture.

To them, biotechnology is the ultimate in corporate vertical integration, where control begins with the gene and ends at the supermarket. To the participants at this first-ever Third World biotechnology conference — held in France in March 1987 — biotechnology looks like even less local control, an accelerating loss of indigenous gene pools, and more dependence on the First World, Inc.

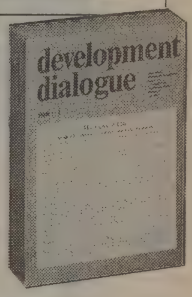
—Richard Nilsen

Figure 3 Cow embryo transfer procedures

•

Historically the processors of products from agriculture have purchased them on the commodity markets. What's going to happen with biotechnology is that you're creating proprietary products out of commodities.

—Roger Salquist, Calgene



The Laws of Life
(An issue of **Development Dialogue**)
Cary Fowler, et al.
1989; 348 pp.
$18 postpaid
from RAFI, P. O. Box 1029, Pittsboro, NC 27312; 919/542-5292.

geneWATCH

Whistleblowers and watchdogs of biotechnology developments raise hell here. Very informative newsletter.

—Kevin Kelly

geneWATCH
Kostia Bergman, Editor
$12/year (6 issues) from the Council for Responsible Genetics, 186 South Street/4th Floor, Boston, MA 02111; 617/423-0650.

•

The Maryland biotechnology firm Crop Genetics International carried out small scale field tests in which microbes with the BT toxin gene were injected into corn plants. The company defended the safety of that test on the claim that the altered microbe takes its residence exclusively in the plant's vascular system. According to RAFI, the company disclosed to EPA that the BT gene was discovered in flea beetles during the field tests. A plausible explanation for this is that an insect feeding on the corn plant picked up the BT gene and became a vector for transferring the gene to non-target species.

•

We need to appreciate that the idea that somehow technology will solve complex human social problems is unlikely to be true. . . .

BioQuip

The BioQuip catalog is the wishbook of professional entomologists and amateur bug-collectors alike. It features nearly a hundred pages of lab and field equipment used in capturing, trapping, preserving, studying, and photographing our little arthropod friends. Since 1947 BioQuip has been supplying major university entomology departments, but they're equally happy filling small orders for individual naturalists. (They were my source for my nine-year-old niece's Christmas presents last year.) Included is a fabulous selection of books and field guides that you will not find assembled in even the most thorough university bookstore. It's true that you could spend a lot of money ordering from BioQuip (and from time to time I like to leaf through the catalog dreaming of a day when I will do exactly that), but the prices on most items are so reasonable that you could put together a set of basic collecting equipment for a very low price indeed. (A serviceable net, killing jar, set of pins, and a box to mount your bugs in will run you under twenty dollars.) —Ted Schultz

Illustrated above, left to right: 7312AA with 7357; 7312AA, 7115GR; 7115GR with two 7312AA; 7357.

Collapsible Nets

Versatile folding nets are larger versions of the famous pocket net which BioQuip introduced in 1956. Collapsible field nets in 15" or 18" diameter fold down to about 1/3 size of the ring diameter. They are stowed conveniently in collecting bags, daypacks, luggage or (large) pockets.

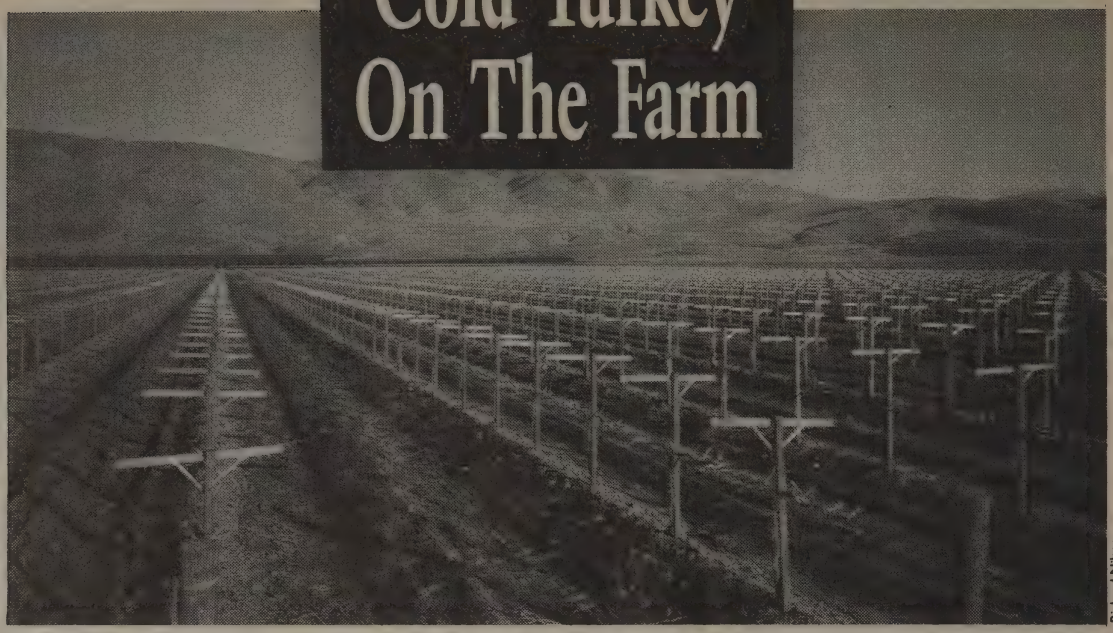
Nets have an anodized aluminum handle, 5" long x ¾" diameter, and spring steel net ring. Aerial bags in white or dark green are standard. The new *7215WA, 7215GA, 7218WA* and *7218GA* extra soft aerial bags also are suitable as extra bags for these nets.

Folding nets are collapsed in the same manner as the *7112CP* pocket net shown on this page. The larger model requires somewhat stronger hands and wrists for refolding.

7115CP **Collapsible net, 15" diameter, with standard white aerial bag** $10.80

BioQuip
(Field, Laboratory, and Storage Equipment for the Natural Sciences)
Catalog **$2** from BioQuip Products, 17803 LaSalle Avenue, Gardena, CA 90248; 213/324-0620.

Cold Turkey On The Farm



Richard Nilsen

Sustainable Agriculture Replaces the Chemical Era

BY RICHARD NILSEN

CALIFORNIA'S FARMERS HAVE STARTED checking their fields into the agricultural equivalent of the Betty Ford Clinic. Any honest accounting of our nation's chemical dependency should include most of American agriculture, but this fifty-year era is beginning to wind down. 'Fessing up to addictions and seeking treatment has become a fact of contemporary life, and farmers are not about to be left out. Maybe we'll end up naming the nineties the Detox Decade.

For some of these chemical farmers, organic methods (lately subsumed under the broader term "sustainable agriculture" — see sidebar) are beginning to look like the option most likely to keep them in business and profitable. The reasons why go way beyond the old argument about organic food being healthier. They now include the health of the soil, the environment and the pocketbook, all driven by a looming barrage of tightening restrictions on agricultural chemicals. Understanding what's going on now with agriculture in the Golden State requires a foray into that giant thicket known as California politics.

The action revolves around the different ways farm organizations, the state government, and individual farmers are dealing with change. Farmers tend to be conservative everywhere; but California's mainstream chemical ag biz is also entrenched, organized, and extremely powerful in the state government. These are large farmers with lots of land and rights to nearly 85 percent of the water in the entire state. Their organizations have tended to be not very sophisticated when it comes to tactics, featuring political conservatism motivated by fear in the service of the status quo. There has been a heavy reliance on a strategy we might call Take-the-Stomachs-Hostage-While-Crying-Wolf, which attacks any objectionable development as the destroyer of all California agriculture. Crudely translated, the message is always: "if you want to keep eating, don't mess with us!"

The problem is that farmer groups like the California Farm Bureau Federation have used this tactic so many times that the public has turned off to the messages. Cesar Chavez and unions for farm workers were going to be the death of California agriculture. So was the Agricultural Labor Relations Board the state set up to resolve those labor/management conflicts. So is anybody or anything trying to interrupt the massive flows of heavily subsidized water. So was, and is, the Medfly. And the federal reform of immigration law. And Proposition 65, the initiative the voters passed that forced the state to identify cancer-causing chemicals and try to do a better job of keeping them out of everybody's water. All of these issues affected farmers in this state, all were perceived by their organizations as dire, but all have been adapted to and survived.

State agencies tend to be pretty good at change — California is such a diverse and populous place they pretty much have to be. The state legislature is the exact opposite — mired in special interest legislation and bought and paid for politicans. We are fast approaching government by lobbyists. This past winter our first state legislator was convicted of taking money to swing his vote, complete with televised hidden-camera video of him discussing dollar amounts with police informants. Because he is generally perceived merely as the one who got caught, some of his colleagues are reportedly running scared. If the agricultural interests happen to own some of these elected officials, they are simply playing the only game in

Part of 990 acres of table grapes in the southern San Joaquin Valley that grower Jon Waters is switching from chemical to organic this year. The vineyard's first-ever cover crop is just sprouting during a very dry winter.

town, no differently than the aerospace, defense, real estate or insurance industries of this state do.

Voting these rascals out is easier said than done, especially given the enormous amount of money it now takes to run for any state office. TV rules, and the political ad writers all seem to be cribbing from *Animal Farm*. In the process, millions can be spent on a race for a single legislative seat. Fortunately there is a way for the people of California to short-circuit this impasse by using the initiative process.

This is a vestige of California's Progressive era at the turn of the century. You can be a concerned citizen, Lyndon LaRouche or the AMA; it doesn't matter: as long as you convince enough of your fellow voters to sign a petition, your initiative can qualify and the whole state gets to vote on it. This makes for long ballots but it functions as an important safety valve for any issue the legislature is unable to deal with. This year the environmental community is sponsoring one dealing with broad environmental reform. The section most affecting agriculture will phase out all chemicals known to cause cancer or reproductive harm. Nicknamed Big Green, its sponsors include Assemblyman Tom Hayden and the state's attorney general, who is also running for governor.

Weed Badger

Weed control in a chemically farmed vineyard is usually done with herbicides. Life without chemicals is making farm machinery smarter, using magic eyes, sensing wands and computers. This rotary cultivator controls the weeds under each row that conventional cultivation misses. Two wands mounted ahead of the tines sense each approaching vine in time to kick the cultivator safely out of the way. Once past the vine, it moves back under the row. Weed Badger, Box 45, Litchville, ND 58461; 800/437-3392.

The California Farm Bureau Federation has done some polling and discovered that in the present climate of public concern over food safety and environmental degradation, Big Green will pass no matter how hard they fight it. So they've decided to run their own competing initiative. If you can't beat them, imitate them. Hope to confuse the electorate with two competing initiatives, each claiming to be the true savior of the environment. The chemical-farming coalition has named their initiative the "Consumer Pesticide Enforcement Act for Food, Water, and Worker Safety," and they are calling their front group CAREFUL, for "Californians for Responsible Food Laws." They have also stuck in a sentence that says if both initiatives pass, the one getting the most votes supercedes any areas of conflict between the two.

This exact same exercise in democracy got played out here two years ago when the insurance industry, faced with a consumer-based reform of auto insurance rates, ran not one but several competing initiatives. The TV ads presented the complete Orwellian nightmare, but the voters saw through them all and approved the consumer-backed initiative and defeated all the others. (What they passed has been tied up in the courts ever since, but that's another story.) If you enjoy watching Frank Capra movies, it was a hopeful sign. And as it turns out, there may be a fly in the Farm Bureau's ointment anyway.

The Mediterranean fruit fly (medfly) has reappeared in the Los Angeles Basin. It has been hitchhiking into California periodically (the last serious outbreak was in the southern part of the Bay Area in 1980-82), usually in tropical fruit sent to individuals through the mail. The packages thereby escape the inspections given to commercially imported produce, and the Medflies are only detected by the time they are already living in the fruit on a backyard tree in some urban hamlet like El Monte.

Should the medfly hop the Tehachapi Mountains and settle into California's agricultural heartland in the great Central Valley, there will be serious trouble, because this insect has the frightening ability to lay its eggs in more than 250 different kinds of fruit and vegetables. The least toxic way to combat medflies is by breeding sterile males and then releasing them in sufficient numbers until the population eventually breeds itself out of existence. But the state has somehow run out of sterile males for now, and is forced to rely entirely on the other remedy, pesticide. To eradicate a few ounces of insects, repeated aerial applica-

The Asilomar Declaration for Sustainable Agriculture

The Committee for Sustainable Agriculture, California's umbrella group for alternative agriculture, held its tenth annual "Ecological Farming Conference" at Asilomar in January. Prior to that, CSA invited two dozen people involved with these issues to Esalen, where they huddled for three days and drafted this working definition of sustainable agriculture. It was a nationwide group, with advocates for consumers from the East and for family farmers from the Midwest, plus organic farmers from California. It also included Wes Jackson, Robert Rodale and Amory Lovins.

Organic agriculture is a set of procedures for growing food; as a name it is, as one participant said, "necessary and not sufficient." Sustainability is a concept that can be applied to any system; in agriculture it is a broad term, involving social and humanitarian issues as well. In fact, this new definition really brings us right back to E.F. Schumacher's Buddhist Economics — the central tenet of each is "Cause No Harm." —*Richard Nilsen*

THE present system of American agriculture cannot long endure. Our farms have succeeded in producing abundant food and fiber. But the costs and fragility of that success are becoming each day more evident.

Sustainable alternatives already prove their value. Not only are they more efficient in their use of energy, biological sources of fertility and pest management, they also enhance rural communities and encourage families to remain on the land. We commit ourselves to hastening the broad adoption of an agriculture that is environmentally sound, economically viable, fair, and humane.

A sustainable agriculture will require and support a sustainable society. Our challenge is to meet human needs without denying our descendants' birthright to the natural inheritance of this planet. We must revere the earth, sustaining and regenerating both nature and our communities. People are a part of nature, not separate from it. Sustainable agriculture is as attainable as it is necessary. Though we recognize difficulties in this transformation, we can state with confidence that in every region there are farm families profitably growing healthy food through a practical partnership with nature.

A sustainable agriculture that provides nourishing food, protects those who work the land, helps stabilize the earth's climate, and safeguards soil and water depends on our ability to meet a number of challenges. We must address these challenges without delay.

Seven Challenges

Promote and sustain healthy rural communities. Healthy rural communities are attractive and equitable for farmers, farm workers, and their families. The continuation of traditional values and farming wisdom depends on a stable, multi-generational population. Absentee or corporate land ownership and the ever-increasing size of farms diminish rural life.

Expand opportunities for new and existing farmers to prosper using sustainable systems. We must devise ways to help people get started in sustainable farming. Reliable information on sustainable agriculture needs to be readily available to farmers, extension agents, bankers, and others. Training and apprenticeship programs should be provided for entry-level farmers and established conventional farmers interested in making the transition. Tax forgiveness or other incentives should be devised to ease the financial stress of new and transitional farmers.

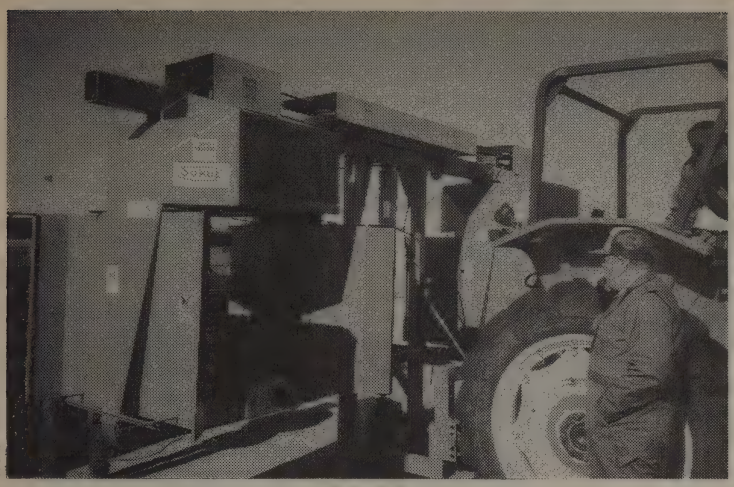
Inspire the public to value safe and healthful food. The biological quality of food is known to affect the health and well-being of those who eat it. Food quality is a key factor in disease prevention. Approaches which are striving to be sustainable — such as organic farming — avoid hazardous pesticide use and maintain nutrient balance. Consumers' understanding of these facts will increase their willingness to pay prices that reflect the true costs of production.

Foster an ethic of land stewardship and humaneness in the treatment of farm animals. Sustainable agriculture recognizes that the gifts of nature upon which it depends — soil, water, plants, and animals, both wild and domestic — are to be treated with loving care and humility. The greatest calling of the farmer is to leave those gifts in better condition than when they were received. Such a responsible agriculture can only be achieved when nature is both mentor and model, and when natural systems are the standard against which success is measured. Farm animals often contribute to ecologically sound agricultural systems and they deserve humane care.

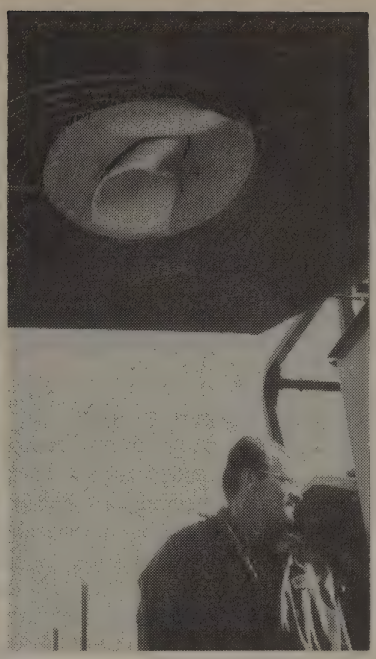
Expand knowledge and access to information about sustainable agriculture. American farmers are innovators. Given scientifically validated techniques, farmers will adopt sustainable agricultural practices. Seeing these practices in the field will speed adoption. We need demonstration farms, farmer-to-farmer field tours, and studies of successful alternative farms of all sizes. University teaching, research, and extension must be redirected toward understanding the whole farm ecology and away from chemical dependence in farm management.

Reform the relationship among government, industry, and agriculture. Government must use resources such as subsidies, grants, and loans to convert significant portions of industrial agriculture to a sustainable system. Undue rewards to concentrated corporate interests should be replaced with fair returns to farmers who sustainably provide food and fiber.

Redefine the role of U.S. agriculture in the global community. The present global agriculture trade is placing unnecessary pressures on the sustainability of the earth's resource base. The United States has a unique opportunity to change that situation. The people of many other countries look to us for agricultural leadership. We can honor that respect by restricting our trade in dangerous substances. We can encourage the Agency for International Development, the World Bank, and international research institutions to convert to sustainable programs. The international programs of universities can become centers of sustainability training and research. □



Richard Nilsen



Farmers don't necessarily save money by switching to organic methods, they just spend it on different inputs. This insect vacuum for grapes was previewed at this year's California Farm Equipment Show. The idea of removing insect pests from food crops with a vacuum instead of killing them with poisons began on strawberries a couple of years ago. Here, a pair of rear-mounted vacuums can straddle two rows of grapes. Air is forced in on the sides and sucked out at the top, where the hat is stuck (right), along with pests that smash against metal walls and die. (It took a good tug with both hands to remove the hat.) This equipment represents an entirely new line of products from an Iowa company that has diversified from building drying fans and heaters for use on stored grain. Sukup Mfg. Co., Sheffield, IA 50475; 515/892-4222.

tions of malathion are currently being sprayed onto the civilization known as Greater Los Angeles.

In the closest real-life analogy yet seen to the drippy, futuristic L.A. depicted in the film *Blade Runner*, squadrons of small helicopters in tight formations, their illuminated spray-booms hissing in the dark, nightly trace precise grids over the densest concentration of voters in all of California. The people below don't like this agricultural version of Bringing the War Back Home one bit. It's one thing to be zipping through farmland on the Interstate and suddenly see a spray plane up ahead, and then catch some of the drift. Roll up the windows, punch the accelerator, and outta there pronto, while maybe thinking, "Sure glad I'm not the poor sucker [farmer] who's got to *live* there and breathe that stuff all the time."

Well, this year the poor suckers live in places like Pasadena, and if tonight is spray night, you bring in the dog, stay in yourselves, and remember to cover the cars and the fish pond and the kid's sandbox. And you worry, and you complain to your elected officials. A lot of people don't believe the state agriculture department's repeated assertions that this spraying is safe for humans, but they are so far powerless to halt it. This is a testament both to the the enormous power of chemical agriculture in California, and to the seriousness of this pest. But how do you suppose these frustrated citizens are going to vote come November?

Some farmers in this state aren't waiting around to find out. Like good surfers, they are trying to stay ahead of the wave in order not to be crushed by it. And it isn't like the Big Green initiative is the only wave out there. The federal farm bill gets revised every five years, and 1990 is the year. New restrictions could result. Over at the Environmental Protection Agency, several of the older pesticides that were grandfathered into the regulations (and thus exempted from the studies newer ones now face) are up for a second look. Some are doomed to regulatory extinction. In a few cases newer and safer chemicals exist as replacements, but either way, the handwriting is on the wall for all to see.

These messages are being read by the manufacturers of agricultural chemicals as well. Typically these are multinational petrochemical giants, and for them the agricultural sector represents a small, and not very profitable, fraction of their total business. Amory Lovins, of the Rocky Mountain Institute, has recently been consulting for three of the largest, and he reports that they consider agro-chemicals as "the world's largest toxic tort. They want out, and are looking for something else to do." Robert Rodale, who has observed these changes for forty years as editor of *Organic Gardening*, described a recent meeting with executives from Dupont, who not only endorsed sustainable agriculture but have positioned their business as one that provides products for it. Says Rodale, "When Dupont tells you they are a sustainable-agriculture company, then you know that you have become the middle of the road."

Farmers have frustrations every bit as genuine as those of consumers. What hurts them most is being perceived by the general public as polluters, as enemies. Since most people live in cities and don't actually

know anyone who farms, this stereotyping may be convenient at election time, but it makes it difficult to see farmers as people, and easy to miss the changes taking place.

Jon Waters typifies the adaptations many conventional California farmers are making. Like his neighbors in the southern end of the San Joaquin Valley near Lamont, he is a large-scale farmer. His family's business, Nalbandian Sales, was started by his stepfather forty years ago; primarily they grow, pack and distribute table grapes. In 1989, Jon, who is 31, experimented with organic methods on 400 acres of his grapes.

"I was real skeptical," he says, "I figured I would have to give something up to go organic. I discovered I was wrong, and that I can produce a better product by being organic than I could doing it with chemicals." He talks about the damage repeated pesticide sprayings do to the plants themselves, of the sodium and heavy metals in the sprays that burn grape leaves and over time weaken the plant and decrease yields. Convinced by his trial, Jon registered all 990 acres of his table grapes with the California Certified Organic Farmers last fall and began the process of converting them to organic.

Waters is not an organic pioneer; in table grapes, that distinction belongs to Steve Pavich, a grower near Delano, who began experimenting with large-scale organic techniques over a decade ago. For years, his operation was the one everyone laughed at; now it's the one being copied. But Waters is ahead of the wave. "I'm rocking the boat," he says. "We're the first conventional business in our district to go full swing the other way. I'm going through a re-learning phase in my career. I don't know all of my costs doing it organically, but I have learned that you don't save any money farming organically. You just spend it on different inputs." Instead of pesticide concentrates at $100 a pound, Waters is spending money for compost, cover-crop seed and organically approved botanical insecticides.

Like all farmers of his scale, it is probably more accurate to think of Waters as a businessman who happens to produce food. His decision to switch to organic is a business decision, based on his best hunch about how to keep his farm profitable in the future. "Whether these carcinogens and mutagens are safe or not is no longer the issue," he says. "Consumers will no longer tolerate them on their food." But there is also a personal factor operating here. He speaks about his mentor, the man who broke him into the table-grape business and who sprayed all his life. He's dead, in his early fifties, from a disease than can be caused by accumulated pesticides in the body. There's no way to prove cause and effect, but it makes Waters think about his own health. "I've sprayed Captan, a known mutagen, for years," he says. "I have three kids, aged six months to five years, and I don't like having to worry about whether the baby will be OK every time my wife is pregnant. I work out in those grapes every day, and I want to minimize my hazards. Farming organically does that." ■

Alternative Agriculture

It's official — organic farming works. Future historians will look back at this book as one more piece of evidence of the sea changes that occurred in that bizarre and wondrous year 1989, when so much Orthodoxy came tumbling down all over the world. And somewhere in America, a handful of farmers who didn't climb aboard the agri-chemical juggernaut after World War II must have wry smiles on their wrinkled faces.

Some of them are in this book, because it is the result of a political decision by Official Science to stop stonewalling and begin to investigate organic versus chemical agriculture. Men with bunches of letters after their names visited representative organic and chemical farmers. They asked questions, took measurements, made comparisons, and discovered that organic farms are economically feasible and environmentally sound. Then they gave them all a new name, and are using this research to justify further grants to perpetuate their bureaucratic/scientific professions.

Watching the scientific priesthood rediscover — and now reinvent — the wheel of organic techniques is cause for a wry smile at least. It was inevitable, because chemical agriculture was not sustainable, either for land or people. The legacy of farm foreclosures, dying rural towns, eroded soil, polluted groundwater and dissatisfied consumers finally overwhelmed decades of official denial that there could be any other way. And it's welcome, because now conventional agriculture can stop persecuting organic farmers and begin learning from them.

Pretend you are an American farmer who chooses to farm organically, and consider the consequences: no Ag School teaches it, no government assistance program recognizes it, no banker will make loans for it, plus you get cold stares from your neighbors in town and public ridicule from the Agriculture Department. Sound anything like the lives of minorities in Eastern Europe, fighting for democracy and free markets during this same half-century period?

Of course in America we didn't jail our organic farmers. We just ignored them, but they didn't go away. The cow shit has finally hit the fan, and it is turning into compost. —*Richard Nilsen*

•

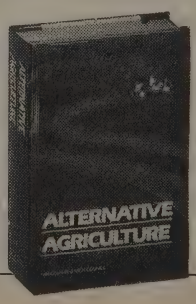
Alternative farming encompasses, but is not limited to, farming systems known as biological, low-input, organic, regenerative, or sustainable. It includes a range of practices such as integrated pest management (IPM); low-intensity animal production systems; crop rotations designed to reduce pest damage, improve crop health, decrease soil erosion, and in the case of legumes, fix nitrogen in the soil; and tillage and planting practices that reduce soil erosion and help control weeds.

•

Farmers who adopt alternative farming systems often have productive and profitable operations, even though these farms usually function with relatively little help from commodity income and price support programs or extension.

Alternative Agriculture
1989; 448 pp.

$19.95 ($21.95 postpaid) from National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418; 202/334-3313.



Sea Vegetables

*To everyone else they are sea**weeds**, but to some, like my family, they are sea **vegetables**. How to harvest, clean, cook, and eat the best "greens" the oceanside (emphasis on the Pacific) has to offer. Good book with numerous recipes.*

—Kevin Kelly

•

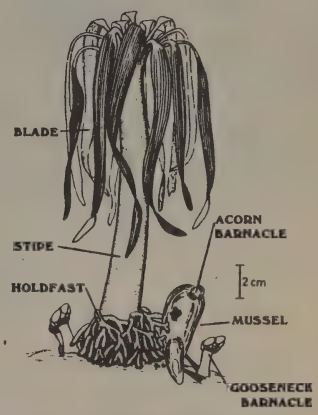
How to Harvest Seaweeds

In harvesting sea vegetables, take great care (observe local regulations; see pp. 212-215) to insure the survival and regrowth of plants, where possible. For instance, in harvesting *Pelvetiopsis,* scissors may be used to snip off the plants, leaving the holdfasts to ensure continued development. Since this holdfast is often encrusted with shell, it requires trimming before eating anyway. In the case of *Alaria,* the blade should be cut well above the sporophylls (the small oval reproductive blades at the base of the large blade) so that the plant can continue to grow and reproduce. Discard frayed ends and discolored portions. The long *Laminaria* species may be cut in the middle of the blade leaving the lower portion intact for further growth. The center portion of *Laminaria* (kelp) is considered the most nutritious and delicious part. *Nereocystis* (bull kelp), an annual, will not grow further when cut below the bulb. If only a portion of the *Nereocystis* fronds (leafy part) are taken, the remaining plant may continue to grow.

•

To take care of the sea vegetables collected, keep the plants cool. Separate from *Desmarestia*. Store fresh plants in the refrigerator. Wash quickly in cool fresh water to get rid of sand and shells. Dry by hanging large seaweeds from lines, and spreading smaller ones on toxic free screens, netting or cloth in the sun and breeze until thoroughly dry. Alternative methods of drying are: spreading in front of a fire or over the stove, if not too hot, or using a food dryer. Store the dried vegetables in air-tight containers away from heat, sunlight and dampness. Double or triple plastic bags work well.

Sea Vegetables
Evelyn McConnaughey, 1985; 239 pp.
$8.95 ($9.95 postpaid) from Naturegraph Publishers, Inc., P. O. Box 1075, Happy Camp, CA 96039; 916/493-5353
(or Whole Earth Access).



Postelsia Palmaeformis
(pos tel' see ah; sea palm)

Sea Palm Zucchini-Cheese Omelet

2 tablespoons oil
2 cups zucchini slices or pieces
1 cup sliced sea palm stipe and fronds
1 garlic clove, grated
½ cup chopped onion
¼ cup sausage (opt.)
¼ cup sliced mushrooms (opt.)
4 eggs, beaten
½ to 1 cup other vegetable (opt.) such as sliced green beans, tomato, pod peas, broccoli, etc.
1 teaspoon Italian seasonings or Spike
salt and pepper to taste
½ cup jack cheese sliced in small pieces

Sauté sausage, if using. Add onion, garlic, sliced sea palm and zucchini, and other optional vegetables. Sprinkle with seasonings. Sauté gently a few minutes to evaporate some of the moisture. Pour beaten eggs on top. Top with cheese. Cover and cook slowly 10 to 15 minutes until eggs are set and the cheese is melted.

Dutch Gardens Bulb Catalog

Dutch Gardens products far exceed what I have found anywhere else, even at my favorite nursery, and the prices are at least one-quarter less. The bulbs are uniformly huge, firm, and heavy, which translates into superior blooms. The catalogs — two per year, spring and fall — also offer a "cooperative purchase plan" which enables individuals to order together with friends, neighbors, family or co-workers in order to profit from the "bonus bulbs" offer. Bulbs are delivered direct from the grower in Holland, at close to wholesale prices, with no delivery charges.

I had been burned so many times by bulb companies ("eye-popping show of color you'll be the envy of the neighborhood flowers for all your friends grow twice the size of any you've ever seen before or double your dollars back!") that I'd almost given up on garden mail order. I'm glad my faith held out long enough to discover Dutch Gardens. Their cascade begonias alone made a believer out of me. *—Lori Leigh Gieleghem*

Dutch Gardens
Catalog **free** from Dutch Gardens, Inc., P. O. Box 200, Adelphia, NJ 07710; 201/780-2713.

►

Snowdrops #163 (Galanthus)
Snowdrops are probably the very first flowers to peep their heads through the ground in the Spring, as soon as the snow had melted. Ideal for naturalizing.
Very Early Spring Flowering 10 for $1.90

GUARD DONKEYS

BY JUDITH E. STROM

ART AND MARGE Christensen run several hundred Targhee/Finn sheep in the foothills of the Ruby Mountains in southwest Montana. Over the years they have tried a wide variety of predator controls, including noisemakers and guard dogs. None had been very successful. Finally, on the urging of John Conter, secretary of the American Council of Spotted Asses, they tried a guard donkey. Since introducing Small One to their flock they have had few losses.

"We had our last coyote kill two days before Small One, our guard donkey arrived. The government trapper has been out and he says the coyotes are still there. We still hear them yipping, but so far they haven't bothered our sheep," says Marge.

But that's not the only reason the Christensens are pleased with their donkey. Art says they went up to gather the sheep and bring them down to the ranch, and the donkey was nowhere in sight. They figured it was off eating somewhere instead of staying with the flock as it should. When they returned the sheep to the pasture, they spotted Small One on a hillside. An investigation found her literally standing over a sick ewe that had aborted four lambs. Marge says the donkey doubled in value in Art's eyes after that incident. A short time later her value shot up again. On a routine check of the sheep, the donkey again was not with the flock. A look around soon revealed her standing guard over a ewe with a newborn lamb.

What the Christensens like, too, is that the donkey lives with the sheep. It feeds with them during the day and beds down with them at night.

"That's the most important part," says Art, " because most coyotes attack at night and the donkey is right there to chase them off."

According to Conter, the donkeys rarely kill a coyote, but they will bray, chase after, and strike out with their front feet. Dale and Marcia Brown in Vermont have seen their pair of guard donkeys drive off a pack of feral dogs by biting and kicking. One dog was kicked through the air and over the fence.

And from Virginia, Zan Stuart reports that one of his donkeys valiantly defended 94 fat lambs from an attack by a pair of German shepherds. Although one lamb was killed before the shepherd arrived, the toll would have been much higher without the donkey.

Why are donkeys, usually gentle, placid animals, effective on predators? The key is the donkey's natural aggression towards strange canines. A female, or jennet, is preferred because they are the most protective. Jacks, or stallions, are not suitable because they can be very aggressive towards any smaller animal, including lambs.

Most operators prefer to use one donkey with each flock of sheep. Especially in free-range situations, they feel two or more donkeys might pal up and wander away from the sheep. Introducing the donkey to the sheep is the critical step. During the donkey's first two weeks with the flock, keep an eye on things but do not pet or handle the donkey. She must get lonesome enough that she "adopts" the sheep.

The fact that donkeys can live permanently with the sheep and eat as they do is one of their main advantages over dogs. They also are cheaper to buy and have a longer working life. Donkeys often live

---

Montana teacher Judith Strom uses donkeys as pack animals for expeditions into wilderness areas, and has recently discovered other careers for them. —*Kevin Kelly*

Judith E. Strom

Small One, a guard donkey, watches over a flock of Finn-cross sheep in the foothills of the Ruby Mountains of Montana.

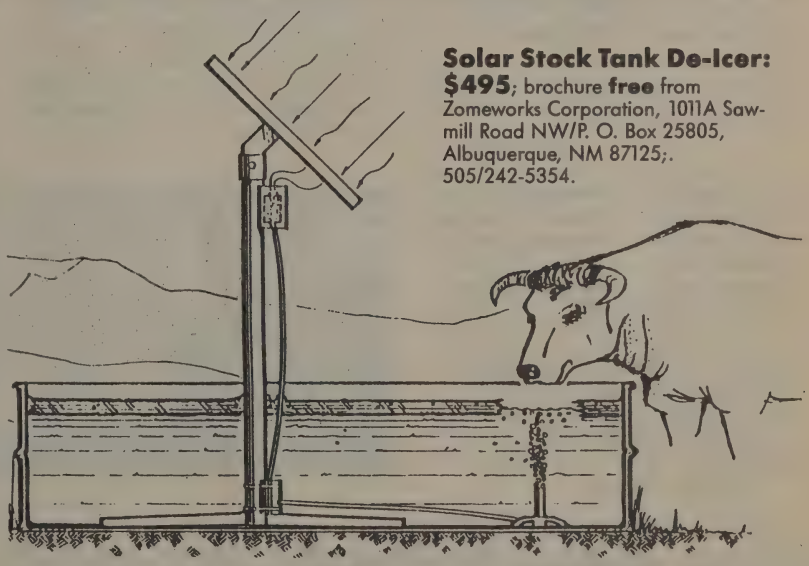
over twenty years. To do the best job for you, though, your guard donkey should not be turned out with your sheep and ignored. Some routine care is necessary. Most important is hoof trimming. If the donkey's feet are neglected, she won't be able to chase predators. Trimming is not a difficult job to learn to do yourself, or you can call a farrier. The donkey should be halter-broken, taught to stand tied and to have its feet picked up to make this job easier. Also be sure to vaccinate and worm your donkey so it will stay healthy and have the energy to do the job.

Finding a suitable prospect may be something of a problem. Some donkey breeders are now raising their foals around sheep so that they will be used to them. Also the Bureau of Land Management has some wild donkeys (burros) available for adoption. Folks in Texas have used these animals very successfully. Others just buy what they can find at the stockyards and then get rid of those that don't work out. Donkeys do have definite personalities, and some turn out to be unsuitable for guard work.

If you're having troubles with dogs or coyotes, consider giving a guard donkey a try. Its raucous hee-haw might become music to your ears. ■

Solar Stock Tank De-Icer

Our friends at Zomeworks add yet another product to their impressive list of clever passive-solar hardware. City slickers may not realize that cattle ranchers have a traditional problem that costs them many hours of the worst sort of labor: cows can't get water if it's iced over, so somebody has to spend their day busting ice. Zomeworks lets the luckless ice-breaking cowboys break broncos or whatever else they do instead, by hooking a small photovoltaic panel to an air pump whose bubbles make holes in the ice, or prevent it from forming in the first place. It'll "melt through two inches of ice in less than an hour of early morning sun," according to the catalog, which has been trustable for twenty years or so now. —J. Baldwin



Solar Stock Tank De-Icer:
$495; brochure **free** from Zomeworks Corporation, 1011A Sawmill Road NW/P. O. Box 25805, Albuquerque, NM 87125;. 505/242-5354.

Blue Ox Log Hauler

I haven't actually tried one of these, but I have observed a user thereof, and they seemed to find it useful. It'll handle a log about four times heavier than you could wrestle along by hand. With a simple attachment, it can be used to haul boulders up to 400 lbs. Another accessory transforms it into a sort of fifth wheel for schlepping trailers around the lot. A nice design, well built. —J. Baldwin

Blue Ox Log Hauler:
$289; brochure **free** from Action Manufacturing Systems, 4242 Elizabeth, Denver, CO 80216; 303/296-0741.

Sacred Elephant

A hymn in free verse, and a multitude of sometimes striking, sometimes astonishing photographs, to the glory and tragedy of the elephant. Williams did a similar (though less successful) book-length poem about whales last year called ***Whale Nation****. He's speaking from and to the heart in* ***Sacred Elephant****. If you already have an affinity for this species, this is a must-have book; if you don't feel a particular love for elephants, this book could create one. If only I didn't feel, reading his words, that he's really written a eulogy.*

(With an index and a lengthy sample of quotations from others.)

—Sallie Tisdale

•

'I had seen a herd of elephants travelling through dense native forest, pacing along as if they had an appointment at the end of the world.'

Karen Blixen, *Out of Africa,* London: The Bodley Head 1937

•

They will examine corpses extensively:
Scanning the whole body,
Using the dilated tips of their trunks
as organic stethoscopes
Conducting an autopsy to determine
the cause of death . . .

•

The Indian elephant is said sometimes to weep. Sir E. Tennent, in describing those which he saw captured and bound in Ceylon, says, some 'lay motionless on the ground, with no other indication of suffering than the tears which suffused their eyes and flowed incessantly.' Speaking of another elephant, he says, 'When overpowered and made fast, his grief was most affecting; his violence sank to utter prostration, and he lay on the ground, uttering choking cries, with tears trickling down his cheeks.' In the Zoological Gardens the keeper of the Indian elephants positively asserts that he has several times seen tears rolling down the face of the old female, when distressed by the removal of the young one.

Charles Darwin, *The Expression of the Emotions in Man and Animals*

•

'All our elephants draw,' McCusker said. He noted in passing that, while Portland's zoo staffers had all witnessed the behaviour, none of them had ever given it much thought. . . .

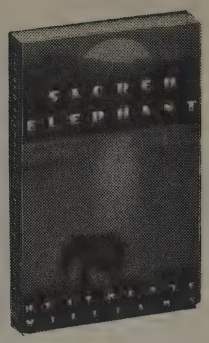
In Buddhism the elephant remains symbolic as the vehicle for divine teachings, a symbol of divine truth. Traditional Buddhists believe that a person will do very well if he models his character on the elephant's.

With that in mind David Gucwa confronted a curious coincidence when he met Jun Yashuda, a native of Japan and a member of the Nipoponzan Myohooi order of Buddhist nuns. He showed her the picture before explaining its origins. Jun-san smiled immediately. She bowed to the photo.

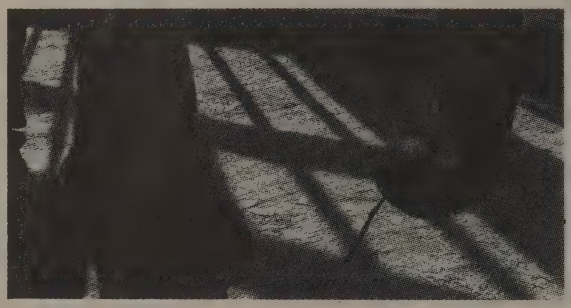
'What does it mean?' Gucwa asked.

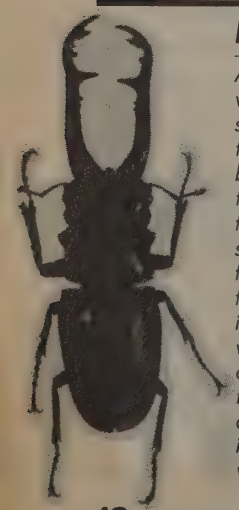
'It is Buddha,' she said. 'If other Japanese or Chinese people see this picture, I think they say the same answer, because 佛 is the picture's line. It is like a Chinese letter. Japanese people also use the same letter. The letter's meaning: 'Buddha'.

David Gucwa & James Ehmann, *To Whom It May Concern: An Investigation of the Art of Elephants,* New York: W. W. Norton, 1985



Sacred Elephant
Heathcote Williams, 1989; 175 pp.
$16.95 ($18.95 postpaid) from Crown Publishers, Inc., 400 Hahn Road, Westminster, MD 21157; 800/733-3000 (or Whole Earth Access).





Maxilla & Mandible, Ltd.

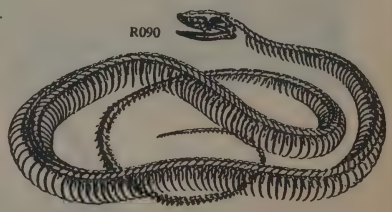
A store of bones. Ribs, jaws, skulls, whole skeletons, preserved insects, shells, certain types of eggs. Many of the whole skeletons are posed: a coiled boa constrictor, and a rattlesnake about to swallow a rat, and a sloth hanging from a branch; others are displayed in shadow boxes to profound effect: a bat, for instance, a chameleon, or several fish. Virtually any species not endangered is available, either bone by bone or whole, including humans. Also kept around as a kind of afterthought are taxidermied specimens, including turtles, a few fossils, and a few pickled items, including a fetal rat. Special orders are welcome, especially interesting "action poses." These guys are instructive conversationalists. A few items are cheaper than you might expect, others very expensive. They do worldwide mail-order and will send you a catalog worth having all by itself for less than ten dollars. No, they won't do your pet, but all domestic animals can be had, from the store's own sources. (They also sell display cases, human reproductions, and insect-collecting equipment, and they fully guarantee everything.)

—Sallie Tisdale

Maxilla & Mandible, Ltd.
Catalog **$9.95** from Maxilla & Mandible, Ltd., 451-5 Columbus Avenue, New York, NY 10024; 212/724-6173.

R065 BOA CONSTRICTOR
C. constrictor

a) sm skeleton	$250.
b) med skeleton	760
c) lg skeleton	1,350



God's Dog

This classic is now back in print. The new edition updates the ongoing irrational persecution of the coyote by the federal government via actions legalizing more extensive poisoning. Passionate and personal, this natural history is based on extensive fieldwork observing and photographing the lives of the animal the Navajos call God's Dog.

—Richard Schauffler

•

I was to come to realize that it is to a large extent this ability of the coyote to adapt to diverse conditions that makes him so difficult to define. At the same time, this versatility is undoubtedly what has enabled the species to survive man's every effort to extirpate him. For the adaptable coyote not only is capable of bivouacking where he pleases, but seems able to adopt any number of life-styles. He can hunt either by day or night, dine on fresh meat or survive off carrion, raid town garbage pits or feast on wild fruits and berries, den in burrows or whelp in conduit pipes, run in packs or operate as a loner. Bold coyotes can be observed in the alleyways of Los Angeles. But shy ones may be heard only in the wilderness, where they fill their private haunts with soulful cadenzas. Even the coyote's physical body reflects his protean quality. In *The Mammals of North America,* E. Raymond Hall and Keith R. Kelson identify nineteen subspecies of *Canis latrans.*

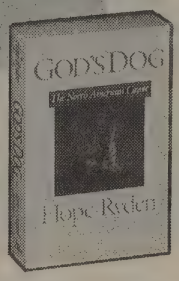
It is almost impossible for the ordinary citizen to comprehend the degree of loathing that Western sheepmen direct toward the coyote.

•

During hard winters, when the herd animals grew thin and died by the score, the little scavengers were able to find a sufficient number of carcasses to keep themselves alive. But conversely, when winters were relatively mild and the elk and deer fared well, the coyotes themselves grew emaciated and succumbed to starvation. Even snow conditions played a decisive role in whether or not the coyotes made it through the winter. If the snow crusted over so that the lightweight canines could walk on top, they managed to maneuver about and find food; if the snow was too soft and powdery to support them, the coyotes became exhausted floundering in deep drifts, and many died.

The coyote's large ears are well adapted to picking up faint sounds of rodents moving about beneath the snow.

God's Dog
Hope Ryden, 1975; 321 pp.
$14.95 ($16.95 postpaid) from Lyons & Burford, 31 W. 21st Street, New York, NY 10010; 212/620-9580.



Jelly Bean versus Dr. Jekyll & Mr. Hyde

There's no one way to train a dog. Just like us humans, dogs respond differently to different types of learning experiences based on their personalities. So, any well-reasoned book from an experienced trainer is to be welcomed, not as the gospel truth, but as another informed viewpoint. The contribution of this book is its approach: consistent positive reinforcement and abstinence from negative coercive methods such as the alpha-dog rollover of the Monks of New Skete or the more brutal techniques of the Koehler Method. There's nothing less fun (if not dangerous) than an untrained dog, so add this book to your collection.

—Richard Schauffler

•

You need a dog's trust to make him perform willingly and voluntarily. There is no command to make a person or dog respect and trust you; and you cannot "punish" trust and respect into a dog. The better options you have to reach this goal are:

- Show him respect and trust.
- Teach him to respect and trust you by handling him only in a positive way. Then a dog is more than willing to work with you, because respect and trust are the preconditions for the manifestation of servitude.

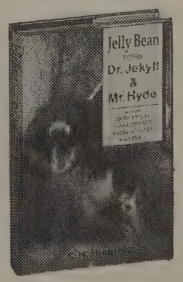
•

"Despite the opinion prevailing among many people, teaching the German Shepherd to bite a man is the most difficult part of the police course. Certain, otherwise excellent, instructors are unable to make dogs attack. No amount of teasing seems able to overcome the dogs' prejudice against violating the person of man. Of the 67 dogs that failed in the police course because of the "unwillingness to bite at any cost," 62 of them earned average to high scores for their willingness in training." (E. Humphrey, L. Warner, 1934)

What is so amazing in this respect is that dogs with a higher willingness to work showed a greater refusal to attack and bite persons, and vice versa.

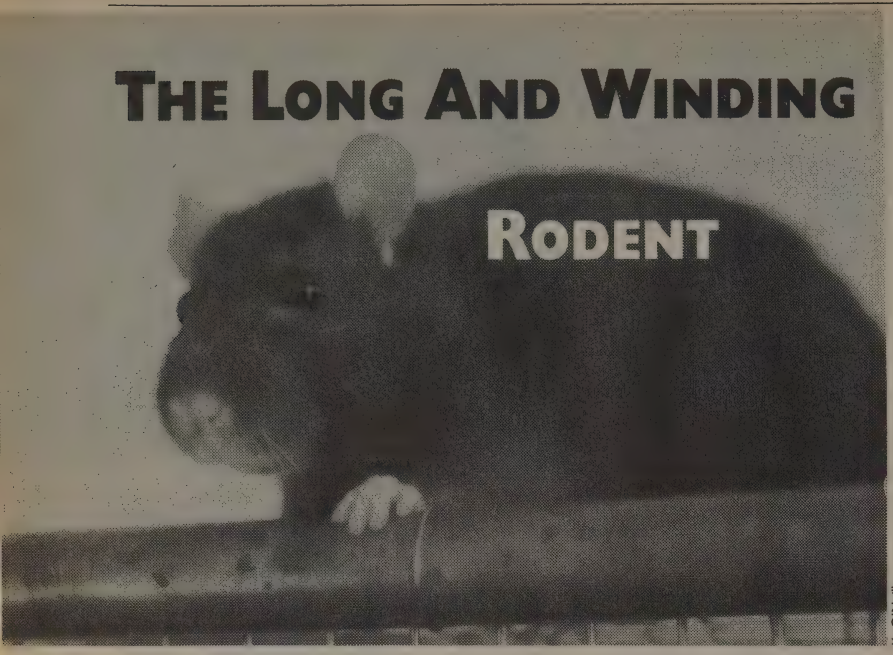
•

The most vulnerable position, which a dog assumes in response to a dominating adversary, is to "voluntarily" get down on his back and present his unprotected belly. He can be forced to do this only as long as he feels weaker than his rival. *He no longer will accept this* when he feels stronger than his adversary. The dog will use any opportunity to retaliate against his opponent and challenge him. This is one of the main reasons why many dog trainers, who teach puppy socialization classes, will not accept any dogs over six months old.



Jelly Bean versus Dr. Jekyll & Mr. Hyde
C. W. Meisterfeld, 1989; 176 pp.
$19.95 ($22.95 postpaid) from MRK Publishing, 448 Seavey, Petaluma, CA 94952; 707/763-0056 (or Whole Earth Access).

The Long And Winding Rodent



K. O'Neill

BY KATHLEEN O'NEILL AND JAMES DONNELLY

Becoming happily infested

RATS are nicer than you think. Rats are nicer than we thought.

We have a dog, have had cats, and like both. When we decided we'd like another pet our housemate nixed cats, and two dogs seemed one too many, so we started casting about for an alternative. Though we've both been around a number of animals large and small that we liked, living in the city reduces what you can keep pretty significantly.

We started hanging around some pet stores so much they stopped asking "Can I help you?"

More and more we found ourselves in front of the rat cages. Rats were small and furry, a plus. They didn't need exotic homes or food and, at $3 per, fit our budget. Once we stopped thinking of them as dirty rodents who lived in sewers and realized they were clean little animals who, in this case, originated in Marin County, we started looking more seriously.

We found a used parakeet cage and, as James started building the Rat Palace Mark I, started shopping in earnest.

"We're interested in a rat." we announced to the nicest pet-store owner we had found.

"Is that for a pet or, er, as . . . ?" she asked. We discovered that most pet-store rats become snake food. When we assured her that we wanted a pet and asked for a female, she opened a cage with several white-footed, dark-grey rats that looked a lot like Beatrix Potter illustrations.

"These are very friendly," she said as one crawled onto James' shoulder and wrapped him around her little prehensile paw.

We were rat owners: rather, Fifi came into our lives. "Fifi" because it was a whimsical name for an animal that seems to intimidate people. We found many people almost horrified at the notion of keeping a rat as a pet. Most small-mammal products don't mention rats, either. *FOR YOUR HAMSTER, GERBIL or other rodent,* the package for some treat would say. Sometimes we'd call Fifi a 'long-tailed Belgian hamster," just to see the difference in people's reactions. On the flipside, there were other rat owners, like the one who jumped out of her new BMW when we came out of the Mill Valley store with our current rats Holly and Ivy. She was an impeccably dressed, well-groomed, middle-aged woman who asked if those were rats in our cage and proceeded to gush about her Charlie. You just never know.

Mostly people are taken aback, then charmed, when they meet them.

Fifi knew no fear; she may either have been lightly retarded, or have knocked her little brain loose in the course of hurling herself off the top of the dresser to get at the dog kibble. Along with the coffee, booze and dessert, she would turn up on the dining-room table at the end of a dinner, choosing bites of this and that and invariably making a beeline for the lap of whatever guest was most phobic about her genus. And peeing; she was a moist little thing.

The first time Fifi met Tesla, our Aussie shepherd/border collie, who is trustworthy around any animal she's been introduced to, Tess snuffled her nose through the cage wires; Fifi sauntered up, reached out a paw and gave Tess's nose a *honk-honk* squeeze. When they got to know each other better they would have mock fights, with Tesla making toothy snarls and Fifi arching her back like a cat, hair out and dancing sideways. It usually ended with the rat chasing the dog around the room; once Tess leaped into Kathleen's lap for refuge.

Compact, lightweight, portable:

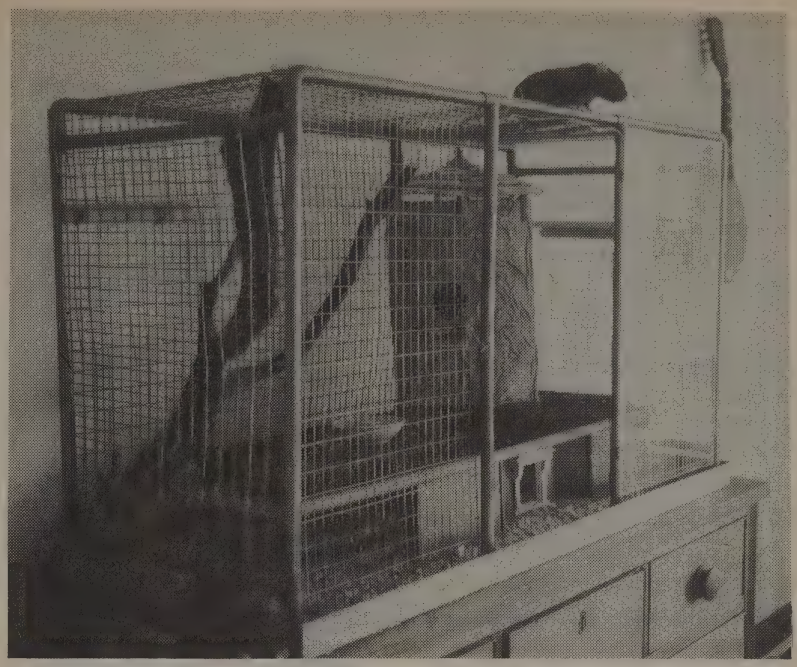
Rodents loose upon the land

Friends have glowingly described a lodge on the Eel River and mentioned that the cabins are very well set up for cooking.* We make the arrangements, load dog, rat and raw materials for a three-day Thanksgiving into the car, and set out through pouring rain. Well along in our journey over bouncy bumpy hot-patched washed-out roads, a piercing doggy screech is heard from the back seat. Fifi's water bottle is still attached to her travel cage and she is soaked, her hair all staring like that of a genuine feral sewer rat and her eyes wild. She has responded to the dog's solicitous nose-against-the-bars with the first and last chomp of her life. She is the angriest-looking rodent one could imagine. On arrival at our cabin we fold up a towel on the nightstand, bend the goose-neck student lamp down close to it, and insert the sodden furious rodent between the two. With an audible sigh, she flattens out to roughly the size of a pie plate. Warmth! Droughth!

Cross-country auto trip with dog and rat #2 (Lily). Nature of our reception by various woebegone dusty dumpy motels anticipated with some nervousness on account of dog occupancy question ("she won't chew the mildew, will she?"); long-tailed Belgian hamster room rates not inquired into. Kustom travel cage wrapped in pillow or jacket and introduced into motel rooms at a lope.

*Two battered soupspoons and an aluminum skillet, as it turned out.

Holly (or Ivy) watches for whales from roof of RPmk.III. Manzanita branch inside proved to have termites, but rats ate 'em up. Ivy (or Holly) lurks in foreground, dreaming of Conquest.



K. O'Neill

In one particularly grim and smelly outpost on the high plains east of Denver, Lily, romping on the dubious carpet, disappears. To our horror we discover a gaping hole in the cinderblock foundation immediately behind the heater. After 45 minutes of hallooing promises and entreaties down this black pit we squat back on our haunches in despair. Lily emerges from her Kustom travel house, to which she had retired unnoticed ("Where food?"). Occupant of next room probably bemused . . .

In the morning, we scatter rat hockey behind furniture and under the bed to alarm our hostess, just for meanness.

Rats love their homes and will usually return of their own choice. They also dislike too much change in the layout: adding a new element isn't too bad, but change the direction of their door and they'll sulk for a few days.

They're lively, friendly, and smart for something with a brain the size of a pea. They also smell remarkably good, somewhat between chocolate, tortillas, and cherry blossoms. When we took Lily on the big trek back to family in the Midwest, Kathleen made her long-suffering aunt (mother of eight boys) sniff as she held Lily in her hand. ("Smell rat butt, Auntie!")

"All I can smell is your hand cream." But Kathleen wasn't wearing any.

Upon reentry into California, we are stopped at the agricultural inspection station. The people in front of us have sheepishly surrendered a bag of contraband apples to an inspector. Flushed with success ("another job well done") he gives the tatterdemalion innards of our auto a thorough staring ("Dog, check. Guitar, violin, accordion, piles of waste, dirty laundry, check. *What's in that cage?*").

Lily, not your diurnal sort of creature by nature, is prevailed upon to stick her snoot out of her Kustom travel house. "Get it all the way out," says the inspector, "I have to look at the tail." With great generosity Lily emerges and capers nimbly about her cage, waving her long naked scaly pink tail. "Just had to make sure she wasn't a gerbil. They're a no-no."

James Donnelly

200 grams of gleeful destruction:

The rat at home

Currently we have a pair of sisters, Holly and Ivy, and the damned little creeps are just as wild as deer. The same pet-store lady who pressed Fifi on us seemed a trifle dubious about these two, so maybe they're just from one of those unfriendly, xenophobic mountain-rat families; maybe it's that they have each other to beat up on and dryhump, and therefore have less need of inferior human relationships; and maybe it's that their house (Rat Palace Mark III) is so byzantine and big that they get all the stimulus they require down in its dark fastnesses, shoving their kibble stash gleefully from room to room like subterranean gnomes.

We use commercial pine chips as bedding; it soaks up liquid and works as mulch in the garden (we've noticed birds scavenging through the chips for seeds and such that the rats hid but didn't eat). When it's available some sweet woodruff, a shade herb, put in their cage keeps it sweet longer, and they seem to enjoy it.

This brings us to the admonition: keep your rat housing simple. Think not in terms of how many warrens and sub-basements the rodent might enjoy, but how much of a production it's going to be to clean. Consider also the possibility that Rat may wish to stay in when you would prefer it to be out, and design the palace for easy rodent seizure should the need arise.

Our ratcage, in its current incarnation, is framed with half-inch copper tubing and screened with inch-by-half stainless wire cloth (the more easily available half-by-half hardware cloth works fine but allows considerably lower-resolution viewing of the rat frolics taking place within the cage). The house shows neo-Georgian/Frank Lloyd Wright/Disneyland/bogus Colonial American influences which, in the aggregate, are easily as alarming as they sound. Next time, it's back to the simple bifurcated box (rats do appreciate having a windowless hiding place as well as a viewing room).

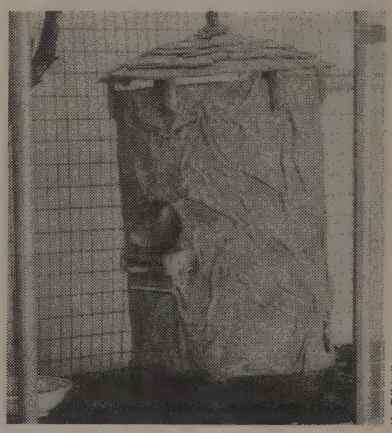
When Rat is elsewhere than in its cage, put away any chewable item that you value. Whether with the most innocent of intentions or through vindictiveness (this is not anthropomorphism; rats are vindictive creatures that will exact swift retribution for perceived maltreatment), your darling will eat big holes in everything from brand-new sweater

to electric cord. While most rats, especially females, have a specific Garden of Excretions, they get excited when on the loose. Fortunately their puddles are minute and their turds dry and unobjectionable in small quantities. Rats love beddy tunnel games, feather ticklings, pursuit of items tied to strings and dragged around — most of the same chase-me-chase-you stuff that cats enjoy. Cold, elastic cooked pasta offers one's rat the opportunity to eat its kill, and you (the pasta-dangler) the opportunity to watch Rat bouncing around on its heinie, snapping at the linguini.

All rats are pack rats. They love taking things home. At first we kept emptying pockets onto the dresser on which the ratcage sat. One morning, half-asleep, Kathleen thought she saw a dollar in the cage; closer inspection revealed nothing, and the fiduciary visitation was attributed to dreaming. Later when we cleaned the cage we found a total of seven dollars.

Lily loved pulling tissues out of the box and dragging them back to her lair. It was always amusing to watch as she jumped to the bed, crossed it trying not to step on the tissue. Down to the floor and across, then for the really hard part: chimneying up the back of the dresser without dropping her prize, and home. She always made it and was always terribly proud of herself.

About the only thing that's not so great about rats is that they don't last too long. Just when you get really attached, at about three years, they go and die. But then that does mean a new baby mammal, always cute, and more refinements to the Rat Palace. ■



K. O'Neill

Rats • Rats

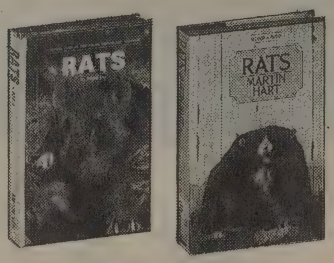
We haven't found a great number of books about rats, but here are a couple.

Rats *by Susan Fox is a nice book for the prospective rat owner. She gives a little background on rats, why they make good pets, and information on their care, feeding and health. The book is written so children (probably the majority of rat owners) can enjoy it and has lots of pictures of rats of various colors, looking cute.*

The other ***Rats,*** *by Martin Hart, is about the history (natural and cultural) and behavior of the animals. Hart trained as a biologist and is known for his creative writing; the combined disciplines lead to a fascinating and very readable book. He dispels some of the myths of ratdom, questions many of the studies done by behaviorists on lab rats, and gives a glimpse into the lives of free rats. Hart, no dreamer, also has a chapter on rat control, or rather its failure.*

Most amazing, though, is the chapter on rat kings, which I won't even try to describe. —*Kathleen O'Neill*

The Rat King of Rucphen (1963). —***Rats*** **(Hart)**



Rats
Susan Fox, 1988; 93 pp.
$9.95 ($11.95 postpaid) from TFH Publications, 211 W. Sylvania Avenue, Neptune, NJ 07753; 201/988-8400.

Rats
Martin Hart, 1973; 172 pp.
OUT OF PRINT.
Schocken Books Incorporated
200 Madison Avenue
New York, NY 10016.

•

You can combine all that your rat has learned, odd/even and colors, into one puzzle. For example, paint the word "exit" on three doors. On one door, paint the word vertically in black letters. On the other two doors, paint the word "exit" horizontally; on one use brown letters and on the other outline the letters in black. The rat can learn to go through the door which has the word "exit" painted vertically in black letters. —*Rats* (Fox)

•

The rat king of Kiel was discovered under the tiled kitchen floor of a prominent citizen. A squeaking had often been heard from beneath the floor and rats had been seen in a hole. In order to kill these rats boiling water was poured down the hole, whereupon four rats jumped out. The squeaking, however, continued. The tiles were then taken up and a rat was spotted that made no attempt to run away. When pulled out by the maid with a poker, the animal came up but without a tail. After a second attempt "a large monster" was lifted up: fourteen adult rats with their tails joined together and squeaking loudly. The animals were immediately thrown into the privy and drowned. —*Rats* (Hart)

Sonotube

Is there anyone here who has never known the need of a Big Tube? You may leave.

Sonotube is the super-heavy-duty cardboard tubing used to form cylinders of reinforced concrete, such as load-bearing uprights for commercial garages. It's available in diameters ranging from four inches to four feet or more, and in lengths beyond the imaginable requirements of ordinary backyard sorts of creativity. Cut to your specifications, it's a bit pricey, but most anyplace that sells the stuff is likely to have scrap ends around.

Our ratcastle features a Sonotube tower, textured on the outside to resemble stone (more accurately, Zoo-Rock) and lined with carpet remnants for the rodents' climbing pleasure. Kathleen also got a 16" x 30" hunk which will someday make a nice coffee table, or something.

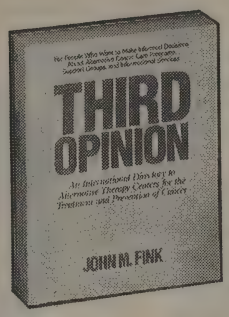
The stuff is eminently paintable, glueable, cuttable and spackle-able. It'll probably benefit from a damp-sponge rubdown beforehand, though; the inside especially feels as if there's some sort of mold-release substance on it, though it might be plain old paraffin. —*James Donnelly*

Sonotube
Check local Yellow Pages under "Concrete Construction Forms," or call Sonoco at 800/333-6611 for your local distributor.

Third Opinion

The field of oncology is, I believe, the most archaic and primitive of all the medical practices (next to mental health). The National Cancer Institute has withheld information from the public for over 50 years that many cancers are dietary caused. Only after this fact was exposed did the NCI and ACS jump on the diet bandwagon. And legitimate research using inexpensive yet effective treatments with vitamin C and laetrile have been snuffed by the FDA because the pharmaceuticals can't make big bucks off these drugs.

John Fink has compiled an excellent international directory to alternative therapy centers for the treatment and prevention of cancer. There ***are*** *options other than surgery and chemotherapy for cancer victims.* —*John August*



Third Opinion
John M. Fink, 1988; 268 pp.
$12.95 ($15.95 postpaid) from Avery Publishing Group Inc., 120 Old Broadway, Garden City Park, NY 11040; 516/741-2155.

•

I must say a word here about quackery, as this, unfortunately, comes up so often. According to Congressman Claude Pepper's 1984 hearings on quackery, a quack is "anyone who promotes medical schemes or remedies known to be false, or which are unproven, for a profit." Now, of course, there are quacks out there who will try to take advantage of a cancer patient's situation for profit, both outside and inside of mainstream medicine. And deceit, pretense, and fraud in serious medical matters are inexcusable and criminal. But it seems unfair to categorize unorthodox healing methods as quackery simply because they are "unproven." A U.S. Government report stated, "it has been estimated that only 10-20% of all procedures currently used in medical practice have been shown to be efficacious by controlled trial." By this definition, wouldn't that make the remaining 80-90% of accepted medical procedures in the U.S. quackery?

Rehab

Being in the "trade," as I call it, the counseling profession of talking people out of their addictive drug use, I appreciate this book. Written by a recovering alcoholic who took two years of his life, traveled around the country, and chronicled the best of what he saw in 48 states, this is a consumer's guide to treatment.

A serious drawback with the book is that the centers mentioned are mostly oriented towards adult treatment. (Well-heeled adults at that.) A few have adolescent components, but these were not reviewed. In an honorable-mention section he does mention a few women's-only centers he felt deserved attention, but only after he found out why such places fill a critical need. This, I feel, reflects the industry's generic insensitivity towards women, ethnic minorities, and indigent populations.

As a treatment person, I found everything I would want to find out about an inpatient (28- to 33-day stay) treatment center, before committing kilobucks to my health and wellbeing. The author asks and answers good questions, ones you won't find in the Q&A section of a hospital brochure. (This is, as he points out, a booming business.)

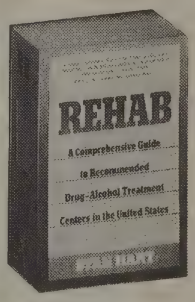
For example: Betty Ford Center (which Hart rates Excellent) is one of the least expensive in the country. But there is a 3- to 4-week waiting list, and you have to ask yourself as Hart did, "Would I go to Betty Ford to get well, or to meet a movie star, rock star, or astronaut?"

Programs were rated on how healthy the atmosphere and the staff were. Special treatment population emphasis (i.e. gender or drug of choice) was noted. The author, with one exception, visited every place personally. That and the detailed, insightful, and informed commentary make this an excellent contribution.
—*Mark Harris*

•

I also looked for simplicity. "Keep it simple" is a saying in AA. It is basic to recovery: one step at a time, one day at a time. Programs that lose their focus due to a plethora of special tacks and diversions may be too complicated for the average patient. Although some very bright, complex addicts may respond positively to a variety of techniques (yoga, assertiveness training, arts and crafts, sports, field trips, biofeedback, lectures and work on nutrition, daily chapel, hugging), the focus should stay on chemical dependency. Aftercare can be forever, and there is plenty of time, once a person is sober and on the way toward a sane and meaningful life, for the treatment of troubling issues such as marriage problems, issues relating to the adult child of alcoholics, leisure time problems, life style problems.

Rehab
Stan Hart
1988; 513 pp.
$10.95
($14.45 postpaid) from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).



The Health Resource

*This personalized medical research service provides you with information and bibliographic data on whatever ails you. You fill out a short health questionnaire and send it in by mail; they do the research. Satisfaction is guaranteed or you get 100 percent of your money back. Founder/researcher Janice Guthrie started the service after teaching herself medical research skills in pursuit of knowledge about her own cancer. I sent for information on my foot condition (*pes cavus = *high arches + wide feet + claw toes) and got back a spiral-bound notebook of xeroxes of articles from medical journals and other sources about the subject within a week. Since the research showed that arthritis is a side effect of my problem, they included information on how to minimize that as well. If you want to treat yourself, make a major medical decision, or simply equip yourself for an intelligent discussion with your medical professional, this is a good place to go, by mail or phone.* —*Richard Schauffler*

Owner and operator Janice R. Guthrie.

The Health Resource
$79 postpaid for a full report (50-150 pp.) within 10 days.
$54 postpaid for computer printout of a search of current international medical literature and 3 articles from medical journals.
$38 postpaid for a mini-report.
From The Health Resource, 209 Katherine Drive, Conway, AR 72032; 501/329-5272.

Everest & Jennings Avenues

Fashion for the wheelchair set. Specially engineered clothes for "chair users" that are cleverly practical yet look snazzy, even suave. The models, who are all chair users in real life, are so elegant in these threads they make the wheelchair look like a hip fashion accessory. Shaking off the "dorky" image of the handicap is a major achievement.
—Kevin Kelly

Everest & Jennings Avenues
Catalog **free** from Everest & Jennings Avenues, 3233 E. Mission Oaks Blvd., Camarillo, CA 93010; 800/848-2837.

As you leaf through Avenues, note the special numbers after every item. They refer to the illustrations of fashionable, functional benefits you won't want to miss.

Eliminate binding, bunching, and gaping for better comfort and fit with our SEATED SHAPE and ELASTIC WAISTBANDS  1

Get a grip on pants for speedier dressing with INSIDE WRIST LOOPS  2

Place your carry-alongs within easy reach with ACCESSIBLE POCKETS  3

Enjoy quick dressing ease, hidden in attractive designs with FULL SIDE SKIRT OPENINGS  4

Simplify dressing and changing with HIDDEN PANT ZIPPERS (In leg or crotch seams)  5

Opt for neat, custom-tailored appearance with SHORT CUT JACKETS  6

Allow freedom of arm movement (even in office attire) with ACTION BACK PLEATS  7

Select easy closure options with HIDDEN VELCRO-STYLE FASTENERS or FINGER RINGS FOR TROUSERS  8

•

Black satin pants. Our softly gathered black acetate satin pants with full elastic waistline, lateral crotch zipper and one belt loop in back. Dry clean. Sizes A, B, C, D. Features: 1, 2, 7. *#1447, satin pants*
$35.00 Made in U.S.A.

•

New breakaway slacks. At your request: handsome slacks with zip-fly front are innovatively tailored with full side-seam openings on both legs sporting zippers. Wider legs will accommodate full or partial braces or cast. With back-of-calf pockets. Lined seat. Grey polyester/wool flannel. Dry clean. Sizes A, B, C, D. Features: 1, 3, 6. *#2431, breakaway slacks*
$70.00 Made in U.S.A.

BIT Catalog

Boston Information & Technology Corp. specializes in electronic equipment for people who have impaired vision. They stock such items as talking clocks, voice-operated telephones that'll dial a number on command, a voice-activated VCR, a Braille/huge-numbered household thermostat, a Braille label-making machine, a money identifier that recognizes different denominations, a magnifying TV camera that shows enlarged books or whatever on the screen. Even their catalog is in huge type and is available in Braille. Good idea. *—J. Baldwin*

Boston Information & Technology
Catalog **free** from BIT Corporation, 52 Roland Street, Boston, MA 02129; 800/333-2481.

•

Satoki Talking Watch
This talking watch from Japan's leading maker announces time in a pleasant female voice at the touch of a button. Other audible functions include chime every half hour, alarm and snooze functions and count-up timer. Digital time and calendar display. Sporty styling, plastic case and band. Alarm sounds a tone, speaks time, or both. Snooze announces time, says, "Please hurry up". Uses two silver oxide button batteries (installed). Three month limited manufacturer's warranty. Not water resistant. Cassette instructions available on request. *SW-1* $74.00

•

BIT/AFB Talking Wallet
The Talking Wallet is the world's first pocket-size money identifier. BIT has pioneered new technology that gives you a money identifier with a handy size and an affordable price. No moving parts and tremendous accuracy.

- Developed by BIT engineers with cooperation from the American Foundation for the Blind.
- The ultimate in financial independence, the Talking Wallet identifies all U.S. currency (except $2 bills) from $1 to $100.

Maddak

Another company offering products for people with special needs including blindness, physical disabilities, and aging, or simply improved function for the rest of us. The products vary from convenience to medical supplies. —*Joel M. Lee*

Maddak

Catalog **free** from Maddak Inc., 6 Industrial Avenue, Pequannock, NJ 07440-1993; 201/628-7600.

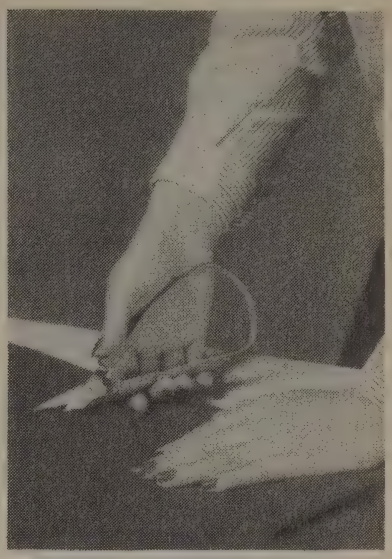
►

Easi-Grip Scissors
Stainless-steel cutting blades have molded-on Nylon handles with integral connecting strap that acts as a spring to automatically open after each cut. No finger action is needed to open them and squeeze pressure is required to close. Each comes with a hang-up holder to protect blades.

◄

Light-Switch Extension Handle
A molded plastic adapter which fits all standard toggle type wall electric switches. It is easily installed by removing the existing switch plate and, using the same screws, mounting the extension handle. The operating handle extends 17" (43cm) below the switch and is well within reach of wheelchair patients, children, the elderly and persons with limited arm movement.

Light Switch Swivel Extension
The long handled swivel extension requires no disassembly of the light switch or plate. An adapter is slid over the light switch toggle and tightened with a screw by hand. The 16" (41cm) extension rod may be tilted outward for the convenience of wheelchair users. Made of high density polyethylene with a plated metal screw. Developed by Richard Kempski.



Rethinking Architecture

In 1979, Raymond Lifchez invited four disabled people to serve as consultants to an architecture course he taught at the University of California, Berkeley. The presence of the disabled consultants, who had no technical expertise in architecture, was meant to get the students thinking of disabled people when designing structures. The participants and observers in this experiment in education report their reactions in these passionately subjective essays. Although resentments between the students and the consultants flared up, most of the students seemed to learn some things about the human aspect of design. One student even went so far as to say that "a large part of architecture is the ability to sympathize with people and to love them." Lifchez's experiment could not only lead to an improved approach to teaching architects, it could also point to changing the way in which other professionals are educated. This is why his book demands consideration from everyone affected by technically brilliant professionals who are too often insensitive to the public they are supposed to serve. —*Mark O'Brien*

•

Within this context of client accommodation, we wanted our students to come to perceive the special needs of physically disabled people as a particularly pointed and complex instance of a universal concept: Every client has some special needs and preferences, which the good architect will discover and work from.

•

A large part of the consultants' work had little to do with accessibility per se. Certainly we answered questions about the height of a grab bar, the turning radius in a bathroom, or the gradient of a ramp. These technical standards do make a difference, but learning technical requirements is not as important to a student's professional development as learning to think about people and about the human implications of design choices.

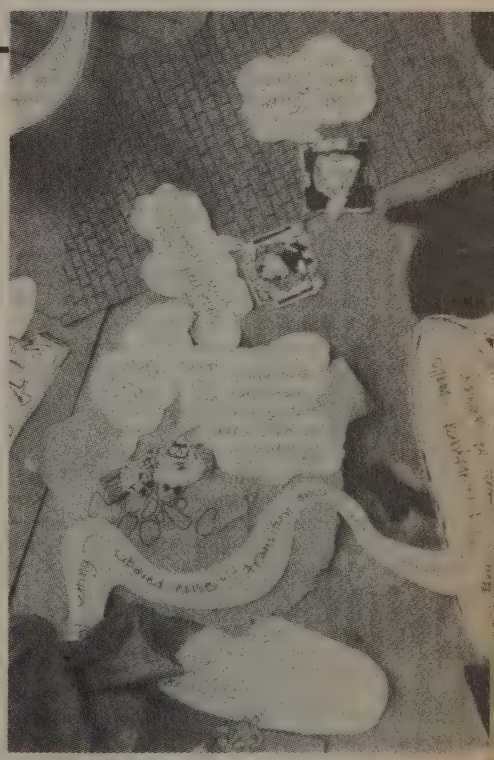
•

The students had particular difficulty imagining a full lifestyle for older clients. The preliminary scenarios depicted older people who sat around doing nothing, having no family, friends, or active interests. These early scenarios also tended to ignore children; when children did appear, they were most often playing by themselves.

Rethinking Architecture

Raymond Lifchez, 1987; 191 pp.

$11.95 ($13.95 postpaid) from University of California Press/Attn.: Order Dept., 2120 Berkeley Way, Berkeley, CA 94720; 800/822-6657.



Students were asked to create two-dimensional collages as a first step in mapping the scenarios for their imaginary clients. The collages expose crucial issues of values, preferences, and feelings about the environment's uses, physical properties (light, heat, sound), and subjective qualities (intimacy, hospitality). The ensuing classroom discussions alert the students to the range of issues they will need to examine in order to understand their clients — and themselves — as they search for design solutions.

The Complete Guide to Health Insurance

This detailed, no-nonsense book defines all the PPOs, HMOs, EOBs, EOMBs, COBRAs and OBRAs, providing a very useful overview of types of policies and coverages, with practical strategies for coping with insurance companies. Additional sections cover special insurance needs (such as children, divorce, nursing home insurance and catastrophic illness).

Health insurance can be so complicated that the easiest response is to close your eyes and ***hope*** *that you are adequately covered. Easy, but possibly disastrous. Reading this book is an easy way to open your eyes.* —*Keith Jordan*

•

HMOs Versus Traditional Coverage

Weigh the pros and cons. Some HMOs make extensive use of specially trained nurse practitioners and physicians' assistants — referred to as "physician extenders" — to handle many routine office visits, to resolve minor problems, and to provide directions to patients.

Some patients like paramedical personnel because they can talk to them on the telephone more readily than most people can talk to most doctors. Such staff are cost-effective because they free doctors to give only medical care. Others view the same factors in a negative way; in the overall scheme of things, doctors are furnishing only minimal services. This attitude is summarized in a joke told by a doctor who is opposed to HMOs:

Patient: How long will I have to wait?

Receptionist: If you're fee-for-service, go right in. If you're Medicare, an hour. If you're an HMO patient, *I'm* the doctor.

•

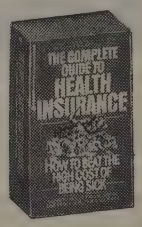
An individual whose income or resources exceed Medicaid's eligibility level may still be able to get Medicaid coverage if the medical bills being incurred are higher than what the individual can afford to pay. For example, a person's monthly income is $150 over the specified level for Medicaid eligibility, this $150 becomes the person's "spend-down" amount (in effect, a monthly deductible), and he or she is responsible for paying bills up to this amount. By proving that medical bills received in any given month have equaled or exceeded this amount, the person can obtain a medical assistance card that covers all medical services for the balance of that month.

•

Single Parenthood

If you are a single woman having a baby, laws are in place that guarantee coverage for your baby. You must, however, switch from a single to a family contract. Be sure to take action and notify your employer in plenty of time.

If an eligible dependent on your contract — say, your daughter — is single and pregnant, you should keep two points in mind: laws are in place that cover the hospitalization and items related to the delivery; however, the grandchild generally cannot be covered as a member of *your* family contract.



The Complete Guide to Health Insurance
Kathleen Hogue, Cheryl Jensen, and Kathleen McClurg Wiljanen
1988; 363 pp.

$4.95 ($5.95 postpaid) from Avon Books, P. O. Box 767, Dresden, TN 38225; 800/238-0658.

You Can Heal Your Life

This self-help book has been an underground bestseller for years, particularly among AIDS patients. It takes the New Age maxim that your health depends on your state of mind/spirit and extends it to the radical position that you are 100 percent responsible for anything that happens to your body. Disease is a symptom of not owning up to something. This extreme viewpoint has its logical problems. Still, I find its sheer fundamentalism to be provocative, irritating and illuminating in putting the notion of holistic healing in perspective. Author Louise Hay's ideas are at the far other end of the pole from the medical orthodoxy's mindset which says that physical laws alone govern health. Her ideas are a challenge to other holistic practitioners, as well. —*Kevin Kelly*

•

Life is really very simple. What we give out, we take back.

What we think about ourselves becomes the truth for us. I believe that everyone, myself included, is 100% responsible for everything in our lives — the best and the worst. Every thought we think is creating our future. Each one of us creates our experiences by our thoughts and our feelings. The thoughts we think and the words we speak create our experiences.

We create the situations, and then we give our power away by blaming the other person for our frustration. No person, no place and no thing has any power over us, for "we" are the only thinkers in our mind. We create our experiences, our reality and everyone in it. When we create peace and harmony and balance in our minds, we will find it in our lives.

Which of these statements sounds like you:

"People are out to get me." "Everyone is always helpful." Each one of these beliefs will create quite different experiences. What we believe about ourselves and about life becomes true for us.

•

No matter what the problem is, our experiences are just outer effects of inner thoughts. Even self-hatred is only hating a thought you have about yourself. You have a thought that says, "I'm a bad person." This thought produces a feeling, and you buy into the feeling. However, if you don't have the thought, you won't change the feeling. And thoughts can be changed. Change the thought, and the feeling must go.

•

If you find yourself saying, "Everyone always does such and such to me, criticizes me, is never there for me, uses me like a door mat, abuses me," then this is YOUR PATTERN. There is some thought in you that attracts people who exhibit this behavior. When you no longer think that way, they will go elsewhere and do that to somebody else. You will no longer attract them.

•

I believe that we choose our parents!

Each one of us decides to incarnate upon this planet at particular points in time and space. We have chosen to come here to learn a particular lesson that will advance us upon our spiritual, evolutionary pathway. We choose our sex, our color, our country — and then we look around for the particular set of parents who will mirror the pattern we are bringing in to work on in this lifetime. Then, when we grow up, we usually point our fingers accusingly at our parents and whimper, "You did it to me." But really, we chose them because they were perfect for what we wanted to work on overcoming.

You Can Heal Yourself
Louise L. Hay, 1984; 203 pp.

$12 ($14 postpaid) from Louise L. Hay, P. O. Box 2212, Santa Monica, CA 90406; 213/394-7445 (or Whole Earth Access).

Intimate Strangers • In a Different Voice

While it's politically correct to say men and women are the same, my personal experience tells me men are actually alien beings. Marriage, of necessity, brings out the cultural anthropologist in me. I experience the "other" close up, as participant observer, alternately fascinated, amazed, annoyed, and bewildered by our obvious but often inexplicable differences. These two books helped me make sense of my experience — field guides I call 'em.

Intimate Strangers *takes on the psychological differences. Why men don't talk the way women do (and the way women want them to). Why women skirt so close to psychological dependence, sometimes ending a relationship just to be able to pull back and regain a sense of self.*

In a Different Voice *helped me understand and respect the way men make moral choices by helping me recognize my own moral assumptions. Men base moral choices on principles — deciding which principle takes precedence when faced with a dilemma. Women base their moral choices on relationship — searching for how dilemmas can be resolved without damaging the relationships involved. These two modes of operating result in astounding, often incomprehensible differences.*

Both books added a new dimension to my understanding of myself and others. Improved my marriage too. As my husband is irritatingly fond of saying, "It's almost as if we were two different people."

—Corinne Cullen Hawkins

*[**Strangers** suggested by Dave Williams; **Voice** suggested by Sue Pickard]*

•

It's obvious that the experience of *being* male and *being* female is different. But what has been less clear until now is how the *process* of developing and internalizing a gender identity — so different in girls and in boys because of the structure of parenting — affects the development of ego boundaries and, therefore, determines the shape of feminine and masculine personality in adulthood. *Gender identity* and *ego boundaries* — these are the two elements of self which will be the focus of our attention because these are the two developmental tasks of childhood that are most deeply affected by the fact that women are the primary caregivers of infancy.

•

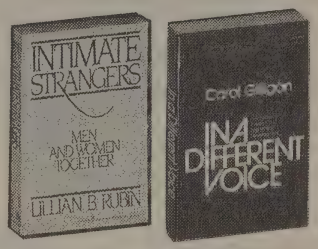
For girls, the process of developing an independent sense of self presents a wholly different set of obstacles. It's another of those contraditions that makes this developmental tale so elusive and so provocative. Just as the fact that there are no obvious differences between a girl and her mother makes the process of establishing a gender identity easier for girls than for boys, the problem of separating — of defining and experiencing self as an autonomous, bounded individual — is harder.

—Intimate Strangers

•

In all of the women's descriptions, identity is defined in a context of relationship and judged by a standard of responsibility and care. Similarly, morality is seen by these women as arising from the experience of connection and conceived as a problem of inclusion rather than one of balancing claims. The underlying assumption that morality stems from attachment is explicitly stated by Claire in her response to Heinz's dilemma of whether or not to steal an overpriced drug in order to save his wife. Explaining why Heinz should steal, she elaborates the view of social reality on which her judgment is based:

> By yourself, there is little sense to things. It is like the sound of one hand clapping, the sound of one man or one woman, there is something lacking. It is the collective that is important to me, and that collective is based on certain guiding principles, one of which is that everybody belongs to it and that you all come from it. You have to love someone else, because while you may not like them, you are inseparable from them. In a way, it is like loving your right hand. *They are part of you;* that other person is part of that giant collection of people that you are connected to. *—In a Different Voice*



Intimate Strangers
Lillian B. Rubin, 1983; 222 pp.

$9.95 postpaid from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

In a Different Voice
Carol Gilligan, 1982; 174 pp.

$6.95 ($8.70 postpaid) from Harvard University Press, 79 Garden Street, Cambridge, MA 02138; 617/495-2480.

OUT/LOOK

One of the biggest problems facing the gay and lesbian community is the uneasy alliance between gay males and lesbians. Many publications targeted to the homosexual community exacerbate this problem by either being explicitly gay male or lesbian. ***OUT/LOOK*** *provides a glossy quarterly magazine for the various segments of the community from radical separatist lesbians to cruising gay males. The result, though sometimes schizoid, is often enlightening. The "Letter" section is often an interesting battleground between the diverse interests and issues of the homosexual community. The journal also includes interviews, fiction, poetry, and opinion pieces. —Lynn Kear*

•

Gay liberation cannot exist in a vacuum and only ask "Is it good for the gays?"

•

Those who live in the heartland of US rural separatism, southern Oregon, report an increase over the last year in the number of inquiries from lesbians interested in moving to one of the half-dozen women's communities scattered along I-5 between Eugene and Grants Pass. Not all of these outposts expressly identify as separatist, but most of the residents subscribe to separatist values and live an essentially separatist existence; as long as you stay on the land, there's no interacting with men. As one 14-year resident of one of the state's women's land settlements put it, "Around here we are all in agreement: we don't want to live with men and we don't want to sleep with men. My life here is totally dedicated to women. I surround myself with women."

•

Today's self-conscious embrace of high-heels, short skirts and other utterly feminine trappings — along with a general revival of interest in fashion and appearance among many lesbians — have been interpreted by some as a plainly regressive set of developments. . . .

Many lesbians also associate the resurgence of gendered fashion with a return to butch-femme roles and forbidden love in smoky bars. Roles were a central and highly-valued feature of lesbian culture — until they were given a bad rep by feminists and consequently stamped out as vestiges of a patriarchal past.

OUT/LOOK
Debra Chasnoff, Editor

$21/year (4 issues) from OUT/LOOK Foundation, 2940 16th Street/Suite 319, San Francisco, CA 94103.

The Albert Hofmann Foundation Newsletter

Despite the outmoded laws and scientifically unsupported taboos that make it nearly impossible almost anywhere in the world to conduct legitimate research into psychedelics, a thriving community of distinguished and undeterred researchers keep the field alive and lively until the day when the dark ages will lift. From Doctor Hofmann, the distinguished discoverer of LSD, to Peter Baumann, M.D., one of the few psychiatrists in the world presently licensed to investigate the use of psychedelics in psychotherapy, to sixties-era veterans such as Allen Ginsberg and Ram Dass, John Lilly and Richard Evans Schultes, Laura Huxley and Terence McKenna, the Board of Advisors constitutes the core of the serious research community. The Foundation has established a library and information center dedicated to the study of human consciousness, is designing a computer bulletin-board system scheduled to go online in the 1990s, and publishes a 12-page quarterly newsletter full of items on ethnopharmacology, psycholitic therapy, and the movement to relegalize psychedelic research.

—Howard Rheingold

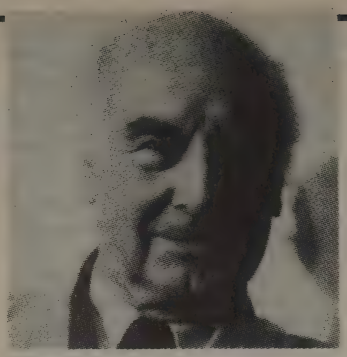
•

[Prof. Jan] Bastiaans was a member of the Dutch resistance during the Second World War, and developed a deep interest in the psychological consequences of the holocaust. From 1947 to 1960, he used narcoanalysis with psychoanalytic psychotherapy to treat patients who had been released from concentration camps and prisons following the end of World War II. However, he found narcoanalysis inadequate to reach certain psychotraumatized and psychosomatic patients. For this reason, in 1961 Prof. Bastiaans began using LSD in combination with short-term psychoanalytically oriented therapy with these patients.

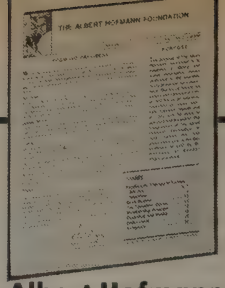
Prof. Bastiaans has worked continuously with LSD longer than anyone else in the world, having held an authorization to use the substance until 1988, when he reached the mandatory retirement age of 70 for university professors. There are now no other authorizations to use LSD in Holland, and the government is not planning to issue any new ones. . . .

In order to avoid drawing public attention to his work, Bastiaans refrained from publishing while still actively working with LSD. Now that he has retired, he hopes to find funding to write up the results of his research.

Prof. Bastiaans recently published *Isolation and Liberation,* a survey of his life's work which includes chapters on narcoanalysis and LSD, his theories of psychotrauma and psychosomatic illness, new insights into the hysterical personality, and a discussion of the psychosomatic aspects of cancer.



Albert Hofmann.



The Albert Hofmann Foundation Newsletter
Edited by Phoenix
Research Foundation

$30/year (4 issues) from The Albert Hofmann Foundation, 1341 Ocean Avenue/Suite 300, Santa Monica, CA 90401; 213/281-8110.

Ceremonial Chemistry

Since the news seems so bleak, you may think it necessary to support the War on Drugs. You might want to think again. Renegade psychoanalyst Thomas Szasz' attack on our last "drug crisis" is perhaps more apropos now than when it was first published (1974). His reasoned and well-documented arguments are persuasive and shocking. For example, he maintains society's drug problems aren't caused by drugs, but are a result of attempts to control drugs. It's not just liberal whining; the ideas may have convinced conservatives like William Buckley to advocate decriminalization.

Perhaps Szasz' most intriguing idea is that drug use is ceremonial in character. Society's suppression of certain drugs (and its promotion of others) is based not on pharmacology, but on contrary religious attitudes, and political and economic power. Szasz' arguments aren't so tightly woven that they admit no holes, but they are extremely compelling.

Although the focus is drugs, Szasz' analysis leads him beyond opium and alcohol to discuss our obsession with weight-watching and Malcolm X. Ultimately, the book is about freedom and society's greed for control: who is permitted to own and control the soul. It's provocative, creative, sensible, and interesting. *—Andrew Dick*

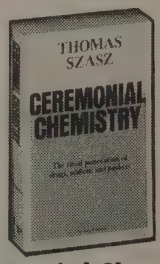
•

As the Christian West once confronted the problem of witchcraft, so now the Scientific World confronts the problem of drugcraft. The one had been as much the product of its own creation as is now the other. The manufacture of the "drug problem" does, however, generate certain phenomena which could be described or dealt with in a number of ways. Many of these phenomena — especially the prohibition of certain substances called "dangerous drugs" and their use called "drug abuse" or "drug addiction" — are now discussed in textbooks of pharmacology. This is as if the use of holy water were discussed in textbooks of inorganic chemistry. For if the study of drug addiction belongs to pharmacology because addiction has to do with drugs, then the study of baptism belongs to inorganic chemistry because this ceremony has to do with water.

Baptism is, of course, a ceremony and is generally recognized as such. Many kinds of drug use — for example, certain types of self-medication — also constitute ceremonies, but are not so recognized. Accordingly, the study of ceremonial drug use belongs to anthropology and religion, rather than to pharmacology and medicine, and should properly be called "ceremonial chemistry." I propose, in other words, that we distinguish more sharply than we have heretofore between the study of drugs and the study of drug use and drug avoidance. Organic chemistry, biological chemistry, and pharmacology are all concerned with the chemical properties and biological effects of *drugs*. Ceremonial chemistry, on the other hand, is concerned with the personal and cultural circumstances of *drug use* and *drug avoidance.*

•

The important differences between heroin and alcohol, or marijuana and tobacco — as far as "drug abuse" is concerned — are not chemical but ceremonial. In other words, heroin and marijuana are approached and avoided not because they are more "addictive" or more "dangerous" than alcohol and tobacco, but because they are more "holy" or "unholy" — as the case may be.



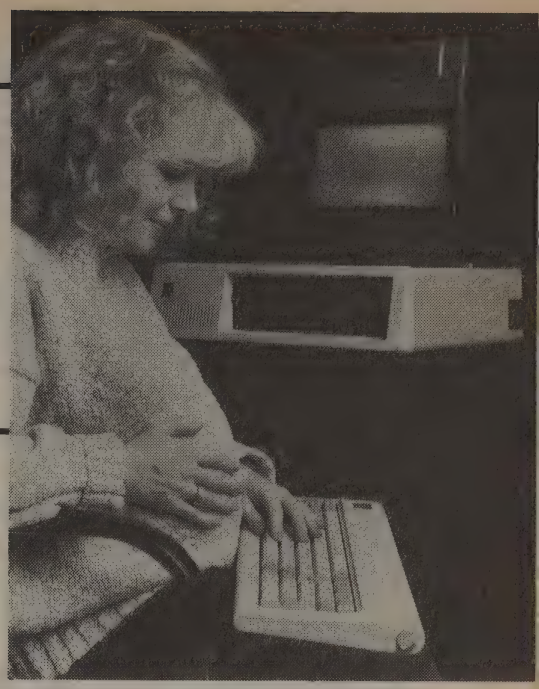
Ceremonial Chemistry
(The Ritual Persecution of Drugs, Addicts, and Pushers)
Thomas Szasz
1974, 1985; 253 pp.

$19.95 ($22.70 postpaid) from Learning Publications, P. O. Box 1338, Holmes Beach, FL 34218; 813/778-6651 (or Whole Earth Access).

The Safe Monitor

Safe Computing Company is the only outfit I know making safe, nonradiating VDTs. Shields on conventional monitors are not effective (magnetic radiation does not travel in straight lines). They also sell and rent magnetic radiation meters. The information packet they put out has a great bibliography, extensive excerpts from Paul Brodeur's ***Currents of Death****, and much other helpful information. When my hospital converts to computerized medical records, I hope this is the monitor we will use. —Tim Ferguson, R.N.*

The Safe Monitor
$795-$1,695.
Brochure free from Safe Computing Co., 33 William Street, Needham, MA 02194; 800/222-3003 (in MA: 617/444-7778).



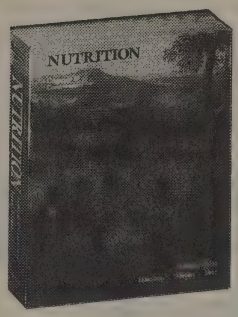
Nutrition

This book lays out the most current scientific knowledge about clinical nutrition in a form which most readers will find digestible. Additionally, it addresses many controversies which bedevil anyone who wants to know how to recognize the difference between "nutritional knowledge" and "nutritional fad."

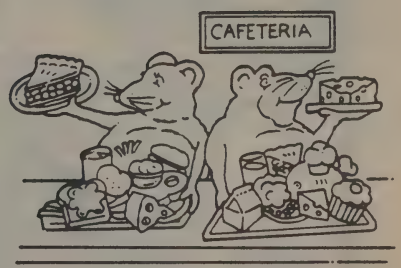
Written by well-trained, well-recognized clinical nutritionists, the book also points to political, economic and social forces which influence the nutritional status of individuals, societies, and the whole Earth. ***Nutrition*** *is beautifully illustrated, with graphics, photographs, tables, charts, and self-study forms.*

As a resident physician in one of the country's best family-practice residency programs, I cannot recommend this book highly enough to readers who wish to "conduct their own education, find their own inspiration, shape their own environment, and share the adventure with whoever is interested."

—Mark Blumenthal



Nutrition
(Concepts and Controversies)
Eva May Nunnelley Hamilton, et al.
1988; 735 pp.
$41.75 ($43.75 postpaid) from West Publishing Co., 50 W. Kellogg Boulevard/P. O. Box 64526, St. Paul, MN 55164-0526; 612/228-2500.



•

Experiments with "cafeteria rats" support the external cue theory. Ordinary rats, fed regular rat feed, maintain their weight, but if those very same rats are offered free access to a wide variety of tempting, rich, highly palatable foods, they greatly overeat and become obese. If you are an external cue responder (or a rat), you had better stay out of the cafeteria.

•

A number of common foods have been observed to cause toxic effects. Consider this list:

• Cabbage, mustard, and other plants contain goitrogens; if these plants are consumed as a steady diet, they can enlarge the thyroid gland.

• Spinach and rhubarb contain oxalates, tolerable as usually consumed; but one normal serving of rhubarb contains one-fifth the toxic dose for humans. . . .

•

What is the best fluid for your exercising body? Surprisingly, cold water, especially in warm weather. It is the optimal beverage for replacing fluids, because it leaves the digestive tract and so enters tissues faster than room temperature water, and it cools the body.

This is a body that vegetables built: Andreas Cahling, a vegetarian.

Table 9–4

Schedule of Hydration Before and During Exercise

When to Drink	Amount of Fluid
2 hours before exercise	About 3 c
10 to 15 minutes before exercise	About 2 c
Every 10 to 20 minutes during exercise	About ½ c or more
After exercise	Replace each pound of body weight lost with 2 c fluid

Source: Adapted from J. B. Marcus, ed., *Sports Nutrition* (Chicago: American Dietetic Association, 1986), p. 57.

ACCESS TO LIBERTARIANISM — 1990

BY JIM STUMM

LIBERTARIAN PERIODICALS RISE AND fall at a dizzying pace. For example, of the six that were reviewed in ***The Next Whole Earth Catalog*** *(c. 1980), only one,* ***Reason****, is still alive.*

Libertarians are people who value freedom above all else, in the spirit of Patrick Henry: "Give me liberty or give me death." As a result, they often agree with liberals on personal-freedom issues, and with conservatives on economic-freedom issues. The moderate majority of libertarians are "minarchists" who would like to see almost all government abolished, leaving only a "nightwatchman state," to defend against crimes with identifiable victims, and foreign invaders. The more radical minority of libertarians, the "anarcho-capitalists," want to privatize even these few remaining functions of government and abolish government 100 percent. They would turn these defensive functions over to competing "private protection agencies."

Reason

All libertarians agree that the vast majority of government functions fall into one of two categories: 1) those that could be performed better and more efficiently by competing, profit-seeking firms, or by voluntary associations, or 2) those that are coercive and harmful, which should not be performed by anyone at all.

A person might find libertarianism appealing if he is highly tolerant of diverse, peaceful lifestyles and behaviors, if he is willing to allow others to do as they please as long as they don't harm anyone, except possibly themselves. On the other hand, libertarianism is of no use to a person who yearns to be a social engineer, who thinks he knows how everyone should live and act and is willing to force people to behave that way, who wants government, or society, or the community, to attack social problems using coercive force if necessary. Libertarians limit themselves to persuasion, except to defend themselves against attacks initiated by someone else, such as the government.

Libertarian publications often go off in a third direction, and bring forward facts and arguments that you won't find in liberal or conservative writings. The detailed analysis of particular social problems that you will find in these libertarian periodicals shows that almost all of these problems are caused inadvertently by government activities, and the best solution is to modify or abolish the government activity that causes them. For example, homelessness is primarily caused by government restrictions on home-building, such as building codes, zoning, and rent control. In calling for less government activity, libertarian commentary differs from that of the left and right which usually calls for more government activity to deal with whatever happens to be their own pet peeves.

There has been little fundamental change in the meaning of libertarianism since 1980, except to note the existence of anarcho-capitalists, who were not mentioned in ***NWEC****, understandably since they don't seem to be numerous enough to support a periodical of their own. There have been changes in tactics since 1980, factions and tendencies have risen and fallen, projects have come and gone. But that much detail is beyond the scope of this brief survey.*

The following sources may be useful to someone seeking information about libertarianism today:

Reason *is a glossy, conservative-libertarian public-policy monthly that may be found on sale at better newsstands. Publisher: Robert Poole, Jr.; editor: Virginia Postrel; $24/year (11 issues) from Box 3724, Escondido, CA 92025.*

Liberty *is now the leading internal theoretical journal of the libertarian movement. Publisher and editor: R. W. Bradford; $19.50/year (6 issues) from P. O. Box 1167, Port Townsend, WA 98368.*

The Pragmatist *presents practical evidence and arguments in support of the view that a free society is the only environment that permits lasting solutions to social problems. Publisher: Hans Schroeder; editor: Jorge Amador; $10/year (6 issues) from Box 392, Forest Grove, PA 18922.*

The Freeman *champions private property, the free market, and limited government, in articles demonstrating that the free market will solve social problems, while continued government intervention will only make them worse. Published by Foundation for Economic Education; free (donation requested; 12 issues/year) from 30 S. Broadway, Irvington-on-Hudson, NY 10533.*

The Free Market*, newsletter of the Ludwig von Mises Institute, presents the economic case for free-market public policies. Editor: Llewellyn Rockwell, Jr.; free (donation requested; 12 issues/year) from Ludwig von Mises Institute, 851 Burlway Road, Burlingame, CA 94010.*

Libertarian Familist *is the newsletter of family-oriented children's rights advocates who maintain that government efforts to "protect" children are almost always harmful and that there should be complete separation of family and state. Editor: Bob Krel; free (financial contributions **not** accepted; 6 issues/year) from 5205 Fairbanks, #4, El Paso, TX 79924.*

LP News *is the official newsletter of the Libertarian Party, which, with around 6,000 members, is probably the largest organization in the libertarian movement. Editor: Karl Hess; $15/year (12 issues) from LP National Headquarters, 1528 Pennsylvania Avenue, Washington, DC 20003.*

In addition, most state LP affiliates publish their own newsletters, and many county and local LP units do so as well. Some examples of state newsletters appear below.

Northwest Libertarian*, editor: Tom Tanaka; $15/year (12 issues) from P. O. Box 23108, Seattle, WA 98102.*
Virginia Liberty*, editor: Marc Montoni; $10/year (6 issues) from P. O. Box 28263, Richmond, VA 23228.*

The Free Kansan*, editor: John Foster; $15/year (6 issues) from Kansas LP, P. O. Box 3735, Wichita, KS 67201.*
South Carolina Libertarian*, $15/year (6 issues) from SCLP, P. O. Box 50643, Columbia, SC 29250.*

The Libertarian Republican *is published by Libertarian Republican Organizing Committee, which believes that the best way to promote libertarian policies is as a caucus within the Republican Party, rather than as a separate third party. Publisher: Colin Hunter; editor: Justin Raimondo; $20/year (10 issues) from LROC, 444 Castro Street, #301, Mountain View, CA 94041.*

The Libertarian Reporter *is the journal of the Libertarian Party of Canada, which has some 1,500 members, organized in four provincial parties. Editor: Nicholas Russon; $5 contribution requested (12 issues) from LP of Canada, P. O. Box 190/Adelaide Street Station, Toronto, Ontario, Canada M5C 2J1.*

Freedom Network News *is the newsletter of the International Society for Individual Liberty, which is probably the largest non-political libertarian organization. ISIL, formerly Libertarian International, promotes libertarianism around the world, and has members in almost 50 countries. The many conferences they have hosted in Europe have laid the foundation for a strong European movement. They are now reaching out to South America and publishing in Spanish, and they are beginning to make contacts in the Third World.* ***FNN*** *covers these activities, and trends around the world. Editor: Vincent Miller; $20/year (6 issues) from 9308 Farmington Drive, Richmond, VA 23229.*

Prometheus *is the newsletter of the Libertarian Futurist Society, an organization of libertarian science-fiction fans, which gives out the Prometheus Award each year to honor the best current libertarian novel. Editor: Len Jackson; $8/year (4 issues) from LFS, 89 Gebhardt Road, Penfield, NY 14526.*

Free Press Network *is the newsletter of the Free Press Association, an organization of journalists who are First Amendment absolutists. They host a yearly national conference and give out the Mencken Awards for the best freedom-oriented journalism of the year. Editor: Michael Grossberg; $25/year (4 issues) from P. O. Box 15548, Columbus, OH 43215.*

The Liberator *is the newsletter of the Advocates for Self-Government, who host living-room seminars around the country at which small groups of invited guests discuss public affairs in a friendly, informal atmosphere. You can get in touch with a seminar leader in your area by writing to the national headquarters in Fresno. President: Marshall Fritz; editor: Steve Smith; contribution requested. Four issues/year from 5533 E. Swift, Fresno, CA 93727.*

★ ★ ★

Laissez Faire Books *is a leading mail-order source for mainstream freedom-oriented books and tapes on economics, philosophy, public policy, etc. Proprietor: Andrea Millen Rich; catalog $3 from 942 Howard Street, San Francisco, CA 94103.*

Loompanics Unlimited *sells "outlaw" books by mail, covering the most extreme aspects of personal liberty, serving the radical fringe of libertarianism, with books about survival, black markets, smuggling, false ID, frauds and cons, etc. Proprietor: Michael Hoy; catalog $3 from P. O. Box 1197, Port Townsend, WA 98368.*

Libertarian Microfiche Publishing *sells freedom literature on low-cost microfiche. Fiches selling for $1 each contain from 98 to 600 pages. LMP has over 750,000 pages available on fiche. Proprietor: John Zube; $2 for introductory booklet and literature lists (US checks accepted); 7 Oxley Street, Berrima, NSW, Australia 2577.*

Reason

★ ★ ★

Directory of Libertarian Periodicals *attempts to keep tabs on the 150 or so known libertarian periodicals of all types, from glossy magazines down to four-page occasional newsletters, listing all that are believed to be currently publishing, with up-to-date addresses and much other information about each one. Editor: Jim Stumm (me); latest edition $3 from Box 29, Hiler Branch, Buffalo, NY 14223.* ■

Special rights of ownership. Street vendor staking out a "pitch" on the public thoroughfare.

The Other Path

Based on solid field research, De Soto's examination of the real Peruvian economy is an inspiring tale of human resilience and ingenuity. (Take a look at the photo section.) At the same time it is a shattering condemnation of overcentralized government in the Third World, right or left. The common idea that countries with a large native population and a turbulent history are too immature for a capitalist economy is disproved by the poor themselves, who create a market economy — in the face of violent resistance by the state — simply for their own survival.

De Soto chronicles the achievements of the "informal" (black market) economy in three areas — housing (the instant barrios), trade (the street vendors), and transportation (the pirate taxis and buses). These now provide most of the housing, trade, and public transportation in Peru. Meanwhile, starting and running a legal business is shown to require a labyrinthine, prohibitively expensive array of contradictory permissions from the corrupt state bureaucracy.

In De Soto's view Peru is practicing a form of 16th Century European mercantilism. In the interest of protecting government and commercial elites, it suppresses the upstart street economy and thereby suppresses the whole national economy. Capitalism hasn't failed in Peru, he says; it hasn't been tried yet. Where it has been reinvented on a small scale by the poor, it has been an embarrassing success.

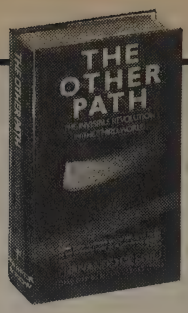
—Stewart Brand

•

Once the land has been chosen, the original group tries to show interested parties that they stand to gain more by joining an invasion than by acting on their own. In this way it begins to assemble the critical mass essential to reducing the possibility of police repression or reinvasion of the settlement by new individuals who try to occupy the free areas. A plan is then drawn with the help of engineers or engineering students. Individual lots in the settlement are distributed. The areas which will in future be occupied by public buildings (schools, health centers, or municipal authorities) and recreation areas (parks or sports grounds) are marked off. A census is taken of the invaders and the contribution they will make to common costs is approved. . . .

The invasion . . . takes place at night or in the early hours of the morning. The date generally coincides with some civic anniversary, in order to reduce the possibilities of a rapid response by the forces of law and order. Whether they are a hundred or forty thousand, the invaders arrive at the agreed place in rented trucks or minibuses, bringing with them poles, rush matting, and everything they need to erect their first dwelling. They enter the land and put up numerous Peruvian flags to show that they are not committing an offense but making a patriotic bid for their rights and for social justice. Immediately after this, pickets demarcate the settlement with powdered chalk, in accordance with the plan. Women and children clear the land and, in a matter of hours, lots have been distributed and rush mats erected on each of them in the form of an "igloo."

At the same time, the communal kitchen which will feed the invaders during these early days is organized. A makeshift child-care center is set up; there, a group of mothers take care of all the invaders' small children so their parents are free to carry out their assigned tasks. Depending on what has been decided or on the size of the settlement, its leaders may also receive and install people who come to join the invasion, thus strengthening the critical mass. Simultaneous negotiations are also frequently launched with the nearest minibus operators' committee to get it to extend its route to the new settlement, making transportation readily available to the invaders. And once the land has been taken over, street vendors soon appear and take charge of supplying the settlers with food and other provisions. Vendors of building materials come equipped with everything needed to build the first homes.



The Other Path
Hernando De Soto, 1989; 271 pp.
$22.95 ($26.45 postpaid) from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

Bridging the Global Gap

The first comprehensive guide that connects you to the many groups engaged in people-to-people exchanges between the First and Third Worlds. The authors cover the spectrum of popular initiatives: alternative trade organizations, sister-city programs, technical assistance programs for the Third World, peace groups, alternative tourism and more. The first part of the book consists of first-person accounts by veterans of grassroots global exchanges, and the final third is a well-designed resource guide to organizations. Global Exchange, the organization that spawned this guidebook, has performed a mighty service to anyone who, in the face of dismal news about rainforests and poverty, longs to stop wringing hands and do something to connect to the world beyond our borders. There's nothing else like it available. —Richard Schauffler

Bridging the Global Gap
Medea Benjamin and Andrea Freedman, 1989; 336 pp.
$11.95 ($13.75 postpaid) from Global Exchange, 2141 Mission Street #202, San Francisco, CA 94110; 415/255-7296 (or Whole Earth Access).

•

Alternative tourist groups try to keep as much of the tourist dollar as possible in the host country.

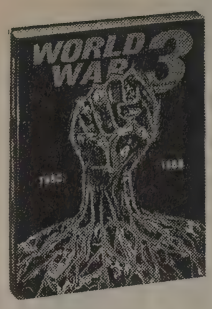
Most commercial tours leave little of the tourist dollar in the host country. A U.S. tour party usually pays the tour operator in the United States, travels on a U.S. airline, stays in a U.S.-owned hotel, is guided around by U.S. guides, and often eats food imported from the United States. Studies show that tour operators claim at least 20 percent of total package prices. Airlines take another sizable chunk. So the share that remains in the tourist's own country can easily exceed 75 percent.

Alternative tours tend to emphasize staying in locally owned lodgings, eating at local restaurants, and employing local counterparts to help lead the group.

World War 3 Illustrated

Powerful black-and-white graphic art and comic strips from the engaged and enraged pens of urban artists. The subjects include poverty, war, homelessness and drugs; it's a poke in the eye from the dark side of America, tempered by what the artists describe as their "oppositional optimism." In a world in which fewer and fewer young people seem to read, books like this may be our best hope. Well, that is, if the book trade doesn't kill them off first ("It's 'progressive' but not 'serious', say the politicos; "It's not a book because it's just pictures," say the book distributors; "It's too serious to be a comic," say the comic-book kingpins . . .). The best of what appeared in the comic format of ***World War 3 Illustrated*** *from 1980-1988 is now collected in this anthology. Get it while you can, where you can.*

—Richard Schauffler



World War 3 Illustrated

Peter Kuper and
Seth Tobocman, Editors
1989; 128 pp.

$12.95 ($15.95 postpaid) from Fantagraphics Books, 7563 Lake City Way, Seattle, WA 98115; 206/524-1987
(or Whole Earth Access).

Thinking Tuna Fish, Talking Death • Corruptions of Empire

"My speech on journalism is simple. Be honest, be fair, but don't be indifferent. There is nothing morally superior about the stance of the voyeur."

—Robert Scheer

I like journalists with a point of view. Add a sense of humor and biting prose, I'm in heaven. Still, the skeptic in me wonders how their now-persuasive pieces will read in a few years. Happily, career-spanning anthologies from Robert Scheer and Alexander Cockburn, my two current favorites, indicate a long shelf life for at least their insights.

The span of both books, from the last of Nixon to the last of Reagan, is fertile ground for such left-leaning critics of the status quo. It is also a territory well worth revisiting in this time of dramatic change throughout the world and short memories at home. *—Keith Jordan*

•

Sparring with Fallaci:
The Playboy Interview

. . . *Scheer:* So those of us who didn't participate in the Italian Resistance cannot challenge that view? What I am challenging is your view of courage. Individual acts of terrorism may be courageous, but don't they just alienate people and end up being self-defeating?

[Oriana] Fallaci: I feel helpless in talking to you, because even if you were a more tolerant interviewer, I feel as if I'm speaking Chinese. Take the Palestinians, for example. I feel they have no right to put a bomb in a bus with twenty-five schoolchildren — and I tell you that Alekos would never, no, never put such a bomb under a school bus. I would like you to recall that he never killed anybody, and the only violent act he did in his life was to put a couple of bombs that did not explode. What he did in Greece was to kill the tyrant, so to speak, which he did very well. And if I were courageous, I would do also. If I were as courageous as he was, I would have killed Qaddafi when I interviewed him. I would have had the guts to die killing Qaddafi — but I didn't.

Scheer: Who else among your interview subjects would you have killed?

Fallaci: Many others.

Scheer: Which others?

Fallaci: I shall not mention anyone I have not yet been able to interview. I am not that stupid. *—Talking Tuna Fish*

•

October 19, 1985 *The Best Tunes*

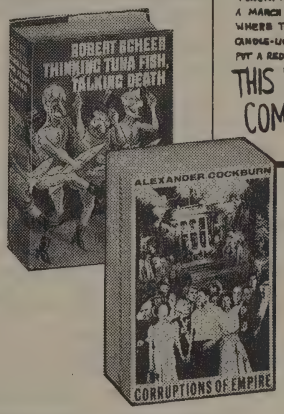
I open my mail. I find a letter from the International Socialist Organization. It begins:

> Dear Sir or Madam,
> The future looks bleak: Racist repression in South Africa. Mass starvation in Ethiopia. Near-record poverty rates in the U.S. . . . Racist and sexist oppression is a fact of everday life. Is there any way out?

What's the matter with the left? How about:

> Dear Sir or Madam,
> The future looks great: White slavers on the run in South Africa. The opening of a revolutionary era in Ethiopia. Popular rage in the U.S. Racist and sexist oppression under attack everywhere.

You don't get far by making people feel bad. My father used to quote sadly the old Communist Party recruiter back in the 1930s: 'Brothers and sisters, even as I speak our comrades in Latin America are writhing in the torturers' thumbscrews, our comrades in India starving in the stinking jails of British imperialism, our comrades in Africa groaning under the boot of the oppressor. Brothers and sisters, join the Communist Party.' *—Corruptions*



Thinking Tuna Fish, Talking Death

Robert Scheer, 1988; 389 pp.

$11.95 ($13.45 postpaid) from Farrar, Straus & Giroux/attn.: Customer Service, 19 Union Square W., New York, NY 10003; 212/741-6900
(or Whole Earth Access).

Corruptions of Empire

Alexander Cockburn, 1988; 540 pp.

$14.95 ($16.70 postpaid) from Routledge, Chapman & Hall, 29 W. 35th Street, New York, NY 10001; 212/244-3336.

NONE OF THE ABOVE

A way to diminish the number of nasty and stupid political campaigns, candidates and officeholders

BY ANNE HERBERT

I WOULD FEEL better about voting if it felt true — if it felt like I was able to state what I think about our shared life by voting. Sometimes what I think is that none of the candidates offered on the ballot is worthy of office.

Sometimes my truest, wisest vote would be "none of the above." I've heard people say things like that for years as graffiti and jokes. It took some democracy rookies, the people in the Soviet Union, to show that none of the above could be a real and powerful choice.

When the Soviets had their first real elections in decades, people had the choice of voting no on the candidates offered. They could vote for one of the candidates or they could vote that they didn't want to vote for any of the candidates, and that vote counted. If no candidate got more than 50% of the vote, nobody won and the election for that office had to be held again. In some cases, candidates who ran unopposed weren't elected because they didn't get more than half the vote — more than half the people voted against them. This really shocked some of the losers. Before the elections they didn't know how disgusted people were. After the elections they did. If the voting system had been like the current U.S. voting system, where somebody always wins no matter how grossed out the voters are, they wouldn't have known how unhappy people were.

Our politicians may not know how unhappy people are with what they are being offered politically. Not voting at all is ambiguous and politicians tend to read it as naughty political indifference whereas in some cases it is profound disgust with the ludicrous choices being offered. We won't know how many people are disgusted, rather than indifferent, until we have a powerful no vote that will give people a chance to vote what they think which in some cases is "The choices offered aren't any good." Politicians sometimes bring in the notion of civic responsibility rather late in the game. We're supposed to be civicly responsible by voting after they have made a mockery of civic responsibility by the quality of campaign they have run.

Consider the current situation in the United States. No matter how nasty, stupid and irrelevant to the community's problems an election campaign is and even if both candidates are clearly not qualified, one of the candidates will win. The candidates who manage to get on the ballot from one of the major parties have, as a group, a bizarre chokehold on power. If they manage to run campaigns that bore or disgust their fellow citizens to the point that only 3 people bother to vote, one of the candidates would still win and get public money and public power.

When our best thought tells us that neither candidate is worthy of office, we should be able to say so with power. It would be simple to enact a law that people can vote that they're not voting for any of the candidates and have that count. If no candidate gets more than 50% of the vote, nobody wins. They'll have to run another election and try to make it less ludicrous and repellent. This would be an effective way to, among other things, make campaigns in which both sides use dirty tactics unsuccessful for both sides. Politicians will need to learn to run a campaign in a way that more than half of the people take one of the candidates seriously enough to vote for even when they have a real choice — the choice of voting no.

THIS COULD BE a good people's movement. And it would have to be a people's movement. There's nothing in this for any politicans in power. Politicians tend to think that the set up that got them elected is practically perfect in every way. There's always room for improvement. If the people in Germany can dance on the Berlin Wall, we can add a litttle more grace to our part of the dance of democracy by making it so we can say no and be heard and heeded when no is the wisest thing to say. Or maybe we could call this new choice on the ballot, "I've looked at the candidates offered and you've got to be kidding." ■

The Self-Help Handbook

What's a small town to do when federal and state funds get scarce? The essential services can't very well be stopped — shut down the sewage treatment plant and the citizens would soon have to abandon the place. This handbook outlines successful strategies and tactics that have saved the day for financially strapped communities. The examples given also can be useful for gadflies claiming that their communities squander money; many of the suggestions here are based upon discovering amazing waste (not necessarily intentional) in the entrenched bureaucracies. When the school board cries for more money, here are some answers besides canceling the sports, music and college prep programs. Good, sensible stuff, and about time, too. —J. Baldwin

•

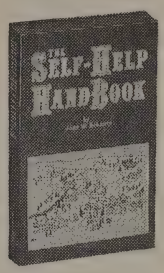
There is a lot of evidence that a successful community enterprise — whether undertaken by a citizen group, local government, or not-for-profits — usually boils down to one key factor: a person. To a remarkable extent, when we track down successful community ventures, we find that they are not explained by the availability of money, severity of the problem, or adequacy of the plan. They are explained by a person who is able to take an idea and make it work.

•

Volunteers can be used effectively as managers as well as laborers. Some 10%-20% of project costs can be saved by keeping the management local rather than employing an engineering or contracting firm to do it for you. "Outside" businesses must mark up goods and services in order to cover their overhead and profit needs. It may be that the local management must be paid, too, although probably at a reduced rate. If appropriately-qualified volunteers can be found to manage the project, so much the better.

•

Encourage women to participate at all levels of the project. The Institute is able to document that women are easily the equivalent of men whether in operating equipment, laying pipe or erecting buildings. Projects which consider women as suitable for only serving coffee and making telephone calls are depriving themselves of 50% of the work force of that community. Women will seldom volunteer for work which is beyond their physical strength, but are frequently the first to volunteer to learn a new skill — at least partly due to their lack of embarrassment in admitting they need instruction.



The Self-Help Handbook
Jane W. Schautz, 1985; 199 pp.

$15 ($18 postpaid) from The Rensselaerville Institute, Pond Hill Road, Rensselaerville, NY 12147; 518/797-3783.

Behind the Silicon Curtain

"Silicon Valley" is not simply a place in Northern California where the apricot trees have been replaced by corporate campuses and housing subdivisions — it has become a metaphor for any region's successful rooting of a high-tech economy. But divorce, depression, drug abuse, contaminated water, economic instability and worse are rampant in the Valley. In this book, Dennis Hayes lifts the curtain of hopeful hype which surrounds the original Silicon Valley and gives us a comprehensive picture of the dangers of separating technology from its social effects.

Hayes spent ten years doing work of all sorts in Silicon Valley, as well as five years covering the Valley desk for ***Processed World*** *magazine (**CQ** #32, p. 124). These experiences prepared him well for this heavily documented study of what life is really like in the Valley — life for professionals and assembly-line workers, life in the workplace and at home, life as it is affected by personal health and environmental contamination.*
—Keith Jordan

•

In Silicon Valley and elsewhere, it was not wanton greediness but rather passion for work and fascination with innovative technology that transcended interest in practically all else, including the professional's current employer. As a Silicon Valley personnel consultant put it, "These days, there is more allegiance to a product or a technology than to any particular company." He might have added "any particular home": in a 1986 survey, nearly 50 percent of Silicon Valley fathers said that their jobs, not their families, were of primary importance to them.

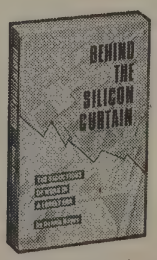
•

Following the trails blazed by electronics capital, the itinerant worker travels from one company to another, finding work where it can be had and working fiercely until a layoff or another job looms. The itinerant worker spans the occupational gamut from microchip fabrication operator to systems analyst, from assembler to engineer. The itinerant's working conditions, status, pay, and workday culture vary widely, too. His or her immediate guises include the temporary worker, the immigrant worker, even the skilled "professional." Some move from project to project and building to building within the same company. Many are likely to quit, transfer, or be laid off within a year or two — provided their department, division, or company lasts that long. Those who remain watch a revolving door of new workers arriving and old ones exiting.

•

ROLM corporation was cited by nearly every corporate culture consultant for its prep school ambience, country club facilities, and employee autonomy — including sabbaticals (for those who stayed on long enough to qualify). At ROLM, "where the future is now," you could play racquetball, tennis, basketball and volleyball, swim laps, lift weights, learn self-defense, enjoy a steam bath or sauna, and bank at an automatic teller machine — without ever having to leave work. In exchange, workers had to adopt the "ROLM philosophy."

As ROLM matured it cloaked itself less in the sheep's clothing of paternalism and more in the haberdashery of bureaucracy. In 1988, ROLM awkwardly amended its "philosophy" by implementing IBM's "clean desk" program. Premised on an active distrust of employees, the policy provides for roving squads of security guards who randomly enter offices after hours to scrutinize "unsecured" papers for proprietary material. "Violations will be reported and appropriate action taken by your manager," concluded the ROLM security memo. (Further invading employee privacy, ROLM makes office phone systems with built-in employee monitoring utilities.)



Behind the Silicon Curtain
Dennis Hayes, 1989; 215 pp.

$10 ($11.50 postpaid) from South End Press, 300 Raritan Center Parkway, Edison, NJ 08818; 800/533-8478 (or Whole Earth Access).

STEADILY increasing postage stamp prices may be an unconstitutional assault on free speech. The argument goes like this: Citizens wishing to communicate with their elected representatives, unlike paid corporate lobbyists, must rely on telegrams, phone calls and letters. For many Americans the letter is the cheapest means of getting in one's "two cents' worth." The problem is, the cost of sending a letter to Congress hasn't been two cents since July 6, 1932, when the cost of a first-class stamp was jacked up to three cents.

"Democracy is supposed to be a two-way street, but it's being turned into a toll road," says a California activist known as Johnny Postalseed. "Postage hikes represent a regressive tax on speech in that they hit the poor hardest," Postalseed claims. "And these days it's the poor who need to be heard most in Washington."

Postalseed heads a group called STAMP (Stand To Acquire Mail Parity), which notes that members of Congress and even the wives of former presidents enjoy a free mailing privilege called "the frank." Congressional newsletters to constituents are sent out free, at taxpayers' expense. "What we need is a franking privilege in reverse," says Postalseed. Since it now costs $3.25 to mail a pound of letters,

many constituents will be forced to choose between a meal or mail — free speech and democracy will be the losers.

Citing the First Amendment, Postalseed contends these rate hikes may in fact be unconstitutional, since the Bill of Rights stipulates that Congress "shall make no law . . . abridging the freedom of speech, or . . . the right of the people . . . to petition the Government for a redress of grievances."

Free or reduced-rate Constituent Mail already exists in several democratic nations — Canada and New Zealand, for instance. Senator Alan Cranston has called the idea "a unique concept, which has the advantage that citizens could more adequately participate in the democratic foundation of their government." For nearly a decade, Senator Daniel Inouye has sponsored legislation to create a class of Constituent Mail, but the proposal has never gotten out of committee.

Some years back, STAMP — while continuing to press for Congressional action — decided to take action on its own and printed its own "Citizen's Rate" postcards. Preaddressed to "Washington, DC," the cards bear the announcement "First Amendment Class Mail" and the appropriate quotation from the First Amendment. "The cards were designed to be mailed with a single one-cent stamp," Postalseed explains, presenting a sample card. "We did it as a protest first, then as a legal test. We figured they would be returned and then we could file a lawsuit on First Amendment grounds."

To STAMP's surprise the cards were honored. Postalseed has used the "Citizen Rate" cards successfully for the last thirteen years. They have been accepted by Congress, the Senate, Cabinet officers, the Joint Chiefs and every President from Richard Nixon to Ronald Reagan. "I've sent hundreds of these cards and received hundreds of replies from all levels of government over the years," says Postalseed. "It looks like we've actually brought back the penny postcard!" ■

Reprinted with permission from Earth Island Journal.

Use this as a template to print your own postcards. Actual postcard size should be a little larger — 5" by 3½" minimum.

Citizen's Address

_____

_____

_____

Place 1 cent Stamp Here

First Amendment Class

Washington, DC

"Congress shall make no law . . . abridging the freedom of speech, or . . . the right of the people . . . to petition the Government for a redress of grievances."
Bill of Rights, U.S. Constitution

Save Our Planet

The twentieth anniversary of Earth Day has inspired about a zillion books intended to help you do your part in assuaging some of the popularized environmental problems. (Assuages guilt, too!) This book is the best of the bunch, so far.
—J. Baldwin

•

Bright Idea

AT&T has set up a model in-house office paper recycling program in its New Jersey offices that is efficient, cost-effective, and popular with its employees.

Two clearly marked bins sit at every desk; one for trash — coffee cups, dry ink pens, leftovers from lunch — and one for paper. The employee separates recyclable paper from the rest of his or her trash merely by tossing it in the right bin. Because processing waste paper is getting more sophisticated, more materials can be recycled, including envelopes with cellophane windows, file folders, and glossy magazines. The paper clips and staples don't have to be removed before recycling, either.

AT&T earned more than $372,000 in 1987 alone from selling its recyclable waste paper, while avoiding disposal costs. So far, the effort has saved about 62,395 trees (the capacity of a nice-size park) and the energy equivalent of 9,176 barrels of oil, enough to fuel 1,250 cars for a year.

•

"People don't think of plastic products as toxic, because by the time they get to supermarket shelves, they're not. But ingredients in plastic production have dangerous properties for those who work with them or live near plastic factories," said the report.

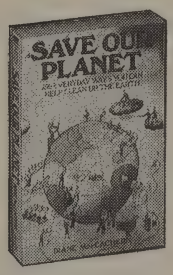
In 1986, EPA ranked the twenty chemicals whose production generates the most hazardous waste. Five of the top six were chemicals commonly used by the plastics industry.

THE TEN MOST FUEL-EFFICIENT CARS AVAILABLE IN AMERICA TODAY

American cars average only 19 miles per gallon of gasoline. But even achieving just 30 mpg is not very ambitious when you consider the kind of gas mileage the cars below are already attaining:

Car	City/Highway mpg
1. Geo Metro, 5 gears	53/58
2. Honda Civic CRXHF, 5 gears	50/56
3. Geo Metro LSI, 5 gears	46/50
4. Honda Civic CRX HF, 5 gears	45/52
5. Ford Festiva, 5 gears	39/43
6. Geo Metro LSI, automatic 3-speed	38/40
7. Ford Festiva, 4 gears	38/40
8. Isuzu I-Mark, 5 gears	37/41
9. Geo Spectrum, 5 gears	37/41
10. Toyota Tercel, 4 gears	35/41

(Source: U.S. Environmental Protection Agency, 1989)



Save Our Planet
Diane MacEachern, 1990; 210 pp.
$9.95 ($11.95 postpaid) from Dell Reader Service, P. O. Box 5057, Des Plaines, IL 60017; 800/223-6834 (or Whole Earth Access).

Shopping for a Better World

Shopping? *Well, yeah . . . no matter how righteous you are, it's pretty hard to avoid buying things. But wouldn't it be nicer, or at least make you feel a bit better, to buy from folks whose sense of social responsibility matches your own? So here's a listing of 138 major companies and the brand names of what they make. Each company is scored as to their record on charitable giving, women's advancement, advancement of people of color, military contracts, animal testing, willingness to disclose information, community outreach, nuclear power, South Africa, environment, and family benefits. The pocket-size guide is arranged in a way that makes it easy to check on a company or product type; e.g. you can look up Salad Dressing and see who you'd rather buy it from, based on whatever of the categories you consider important. Bear in mind that any guide of this sort is not black-or-white perfect in every way; companies, like people, are rarely malicious baddies or angelic goodies.* *—J. Baldwin*

Company or Product	Abbr.	$	♀										ALERT
Good Humor	UN	✗	✓	✓	No	✓•	✓	✗	No	Yes†	?	?	
Häagen-Dazs	GMP	?	?	?	?	?	✗	?	?	Yes†	?	?	dolphins caught
Heaven	NEST	?	?	?	No	?	✓	✗	No	Yes†	?	✓	infant formula
Homestyle+	HOME	?	✗	✗	No	✓	✓	?	No	No	✓	✓	
Jell-O	MO	✗	✓	✓	No	?	✓	✓	No	Yes	✗	?	cigarettes
Louis Sherry	BN	✗	✓	✓	No	✓	✓	✓	No	Yes●	✓	✓	
Meadow Gold	BN	✗	✓	✓	No	✓	✓	✓	No	Yes●	✓	✓	
Minimilk	UN	✗	✓	✓	No	✓•	✓	✗	No	Yes†	?	?	
Mrs. Smith's	K	✓	✓	✓	No	?	✓	✓	No	Yes●	✓	✓	
Nabisco	RJR	✓	✓	✓	No	?	✓	?	No	Yes▪	✗	✗	cigarettes

✓- Top Rating ✓- Middle Rating ✗ - Bottom Rating ? - Insufficient Information
For a more detailed explanation see key on page 10
Page 183

Shopping for a Better World
Ben Corson, et al., 1989; 289 pp.
$5.95 postpaid from CEP, 30 Irving Place, New York, NY 10003; 800/822-6435 (or Whole Earth Access).

American Window Cleaner

Without a doubt the easiest, sutest-to-succeed one-person business one can start up with almost no money down is a window-cleaning service. Not much glamor in it, though. This magazine helps with that and other window-cleaning matters. —Kevin Kelly

This skinny magazine is packed full of industry gossip, politics, readers' comments and tips, and — most interesting — advertisements for the necessary equipment. We're talking guild here; the magazine has the same flavor as those serving the chimney-sweep trade. We're also talking cross-fertilization between this trade and mountain-climbing hardware, architecture, gardening (bird problems, yes?), building trades (trick scaffolds), outdoor sports (how to keep warm while wet), and vocational training (window washing videos). It's a peek in the, uh, window of a profession most of us take for granted. —J. Baldwin

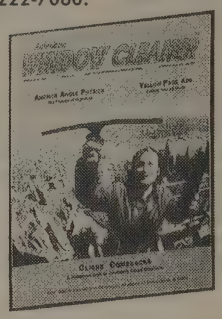
These gloves were designed so that the crew of a window cleaning company in the Northeast could work comfortably in cold weather. The gloves' neoprene material keeps your hands wet and warm. The "Ultimate Glove" fits snug, it's not bulky, and it conforms to the shape of your hands. So why be cold when you can be comfortable?

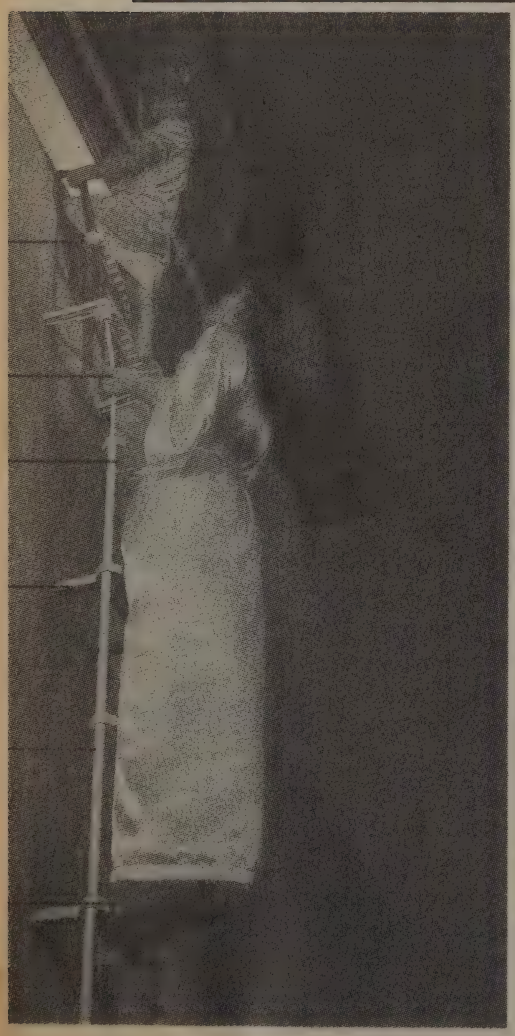
•

I was working for a company once when a major security meeting was halted because window cleaners were hanging outside the windows. This company was having a high-level meeting introducing a new line of products to the board of directors. We were busy cleaning glass when sirens started going off and police cars ordered us down the building. Each of us were checked out and held for about an hour before we were allowed to return to work. All of this could have been avoided if we had checked with the security office before starting.

American Window Cleaner

$35/year (6 issues) from American Window Cleaner, 27 Oak Creek Road, El Sobrante, CA 94803; 415/222-7080.





All-Safe Fire Escape Ladder

This non-permanent fire escape ladder is just what I was looking for. Its nine pounds are light enough and its fold-up design simple enough for my five-year-old to use. It is competitively priced with much heavier metal models, and the combination of metal, rope and plastic is rigid when in use, unlike a simple rope ladder. —Keith Jordan

All-Safe Fire Escape Ladder
$90 — $130

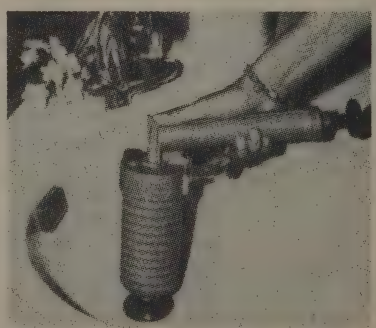
Catalog **free** from Lumark, P. O. Box 6262, Parsippany, NJ 07054; 800/544-5297.

Pango Plunger

If you have a better mousetrap, will the world beat a path to your door? Hasn't happened yet, though there is certainly a whole bunch of devices out there that'll deal mouse-death just fine. Will the world beat a path to the seller of the Pango Plunger, sink and tub unstopper extraordinaire? Let's hope so. The Pango has to be the best device around for that onerous task, and I am not alone in that opinion. It works like this: pump it up with the built-in air-pump handle, insert its proboscis into the clogged drain, hold down firmly (or you'll suffer foul splatters), and pull the trigger. A very sudden blast of compressed air literally blows the obstruction away. No chemicals, no nasty rubber things, no corrosion. Note: it's not really for toilets. You shouldn't use a toilet plunger ("plumber's friend") in sinks and tubs anyway; that's a great way to spread hepatitis and other serious maladies. —J. Baldwin

Pango Plunger

$24.95 from R-Bar Imports Inc., P. O. Box 308, Canfield, OH 44406; 216/758-0515.



If sink has an overflow, cover overflow with a cloth or sponge to avoid air pressure loss. Push the fitting into the mouth of the drain and quickly pull trigger. If the drain does not clear, pump "Pango" up to additional pressure and repeat.

How to Clean Practically Anything

I'd be willing to bet that a shelf of nothing but how-to-clean books now on the market would be about fifty feet long (and you'd have to dust it!). They all pretty much agree on the basics. The differences are in the presentation and oddball tips sent in by readers — tips that may or may not work for you, but will at least give you a nice feeling of having done all you can. (Face it: if you've squirted persimmon juice and wheelbearing grease on your best party silk, you're a dead duck.) Where do you turn for reliable information? Where else but good old trustable ***Consumer Reports****. Everything from that party silk to nasty clogged drains and overpriced shampoo is regarded with* ***CR****'s customary diligence: with names named and lab-tested procedures recommended.*

—J. Baldwin

How to Clean Practically Anything
Monte and Marjorie Florman
1989; 222 pp.

$8.95 ($11.95 postpaid) from Consumer Reports Books, 9180 LeSaint Drive, Fairfield, OH 45014; 800/272-0722 (or Whole Earth Access).

RATINGS OF HAND-LAUNDRY DETERGENTS

Listed in order of estimated overall cleaning quality. Differences between closely ranked products were slight. Except as noted, all are liquids.
The "teaspoons per wash" are based on manufacturer's suggestion for two quarts of water, translated from capfuls.
As published in a May 1989 report.

Product	Average price	Size, oz. or fl. oz.	Tsp. per wash	Cost per wash	Overall cleaning (● Better ◒ ○ ◒ ● Worse)	Brightening	Comments
Softball Cot'nwash	$2.69	12	2	8¢	●	—	—
Kroger Lemon Scented Liquid	1.55	22	1	1	●	—	—
Sears Heavy-duty Laundry Detergent	4.99	128	2	1	●	○	*A*
Silk'n Wash	2.67	8	4	24	●	—	—
Palmolive Dishwashing Liquid	2.10	32	1	1	●	—	—
A & P Dishwashing Lotion	1.32	32	1	1	●	—	—
Pathmark Wool Wash	.99	16	1	1	●	●	—
Cheer	4.46	64	1	1	●	○	*A,B*
Day & Nite Mousse	3.49	12	[1]	3	●	●	*C*
A & P Wool Wash	1.15	22	1½	1	◒	—	—
Delicare	2.19	16	1	2	◒	—	—
Wisk	3.79	64	1	1	◒	○	*A*
Woolite Gentle Cycle	2.31	14	1	3	◒	○	*A,D*
Topco Wool Wash	1.34	16	2	3	◒	●	*A*
Woolite	2.41	16	1	3	◒	○	—

[1] *"Golfball" amount of foam.*

Key to Comments
A–More alkaline than most.
B–Contains stain-fighting enzymes.
C–Foam in aerosol can.
D–Powder in box.

•

Hand-Laundry Detergents
Recommendations
There is no reason to buy one of the specialized brands. Use a dishwashing liquid. All they lack are the optical brighteners that regular detergents and most hand-wash products contain to give whites extra dazzle. At about a penny a wash, dishwashing liquids are bargains.

If you have stains to clean, you'll have more or less luck depending on the fiber and type of stain. Generally, the top-rated detergents worked better than lower-rated products.

The Clean Team

I have taken considerable trouble to reduce that most insidious and despicable of time demands: cleaning up. No little porcelain angels in OUR house (prevention is the best policy). If there were such dust-collectors, they'd either collect dust until you could hardly see them, or if I were rich, I'd hire somebody to keep them clean. Some people hold their kids at psychic knife-point to get the chores done, but the kids know: spending your life dusting little angels is nutty. Assuming that your home isn't a knick-knack museum with you as willing curator, it is logical to reduce the time and effort of cleaning duties. This worthy undertaking is facilitated by procedural know-how and the proper tools. Both can be had from this catalog of professional (as in hotel maintenance) hardware, chemicals, and manuals. Can you totally clean a complex bathroom — mirror, tiles, tub and potty — in ten minutes so that your mom would approve? With the right tools and technique, the answer is a big yes. Now you can go to the beach without coming home to a pigpen. Banish guilt along with the filth. Yeah.

—J. "Squeakyclean" Baldwin

•

ETTORE "SUPER-SYSTEM" SQUEEGEE HANDLE: The smartest innovation in window cleaning since Ettore's first squeegee. This model adjusts itself (no tools required) to the proper angle of the window. The trick to this clever patented design is that the channel pivots to accommodate an awkward angle when the operator applies slight pressure. You can clean windows from difficult angles, windows with odd shapes, windows with curved glass, or windows located below you. This squeegee has all the benefits of a standard squeegee plus you'll be able to clean windows from the most convenient location and from difficult angles without wasting time. Has a quick-release button on top to make changing channels a joy — a feature only available in Ettore squeegees. Comes with an easy-to-follow illustrated instruction Pamphlet. *Pivoting handle only:* $9.95.

The Clean Team
Catalog **free** from The Clean Team, 2264 Market Street, San Francisco, CA 94114; 415/621-8444.

Real Goods Alternative Energy Sourcebook

It has been a true pleasure to watch Real Goods rise from a funky counter-culture supply store to be a thoroughly professional enterprise grossing two million a year. Real Goods must certainly be the leading purveyor of alternative energy hardware; everything from solar-powered deep-well pump sets to hand-powered washing machines. All the stuff is proven — often by the Real Goods staff who actually live with it day-to-day. The ***Sourcebook*** *(foreword by Amory Lovins) continues a tradition of being a veritable AT textbook with extensive chapters explaining theory and practice so you can choose intelligently. (If that isn't enough, a consulting service is offered.) This edition includes a comprehensive discussion of low-energy lighting by Rising Sun's Robert Sardinsky, who is probably the country's best-informed expert.* ***Sourcebook*** *buyers also receive quarterly supplements offering new items, sales, and vigorous reader-user commentary. Gee, this is beginning to sound like I'm on their payroll! I'm not, but I'm always ready to extoll a business that's doing a difficult job well. I've had good advice and dependable products from Real Goods for many years. Oh, and check the* ***Sourcebook*** *cover: it's a one-megawatt photovoltaic power station in the front yard of the now-defunct Rancho Seco nuclear facility. —J. Baldwin*

Real Goods Alternative Energy Sourcebook

$10 postpaid from Real Goods, 966 Mazzoni Street, Ukiah, CA 95482; 800/762-7325 (in CA: 707/468-9214).

Power Produced: 60 amphours per day

RH-2 **$2,450**
Shipped freight collect
(Subtract $250 if you want to get the batteries locally)

SOLAR PHOTOVOLTAIC PANELS:

Remote Home Kit 2 (RH-2)

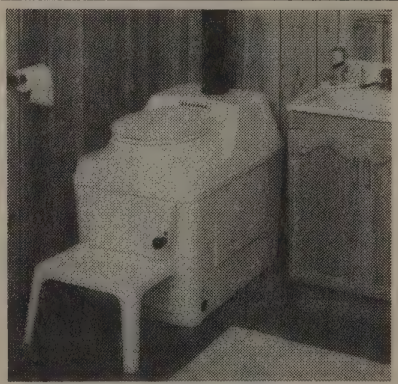
Usage: Full-time home using conservation measures like propane refrigerator/freezer, propane cook stove, propane water heater, and energy efficient DC lighting. System will operate lighting, 110V or 12V TV/VCR, satellite dish receiver, computer system, water pumping, sewing machine, drill, small vacuum, small microwave, juicer, blender, and any 110V appliance up to 600 watts for 30 minutes.

Components:

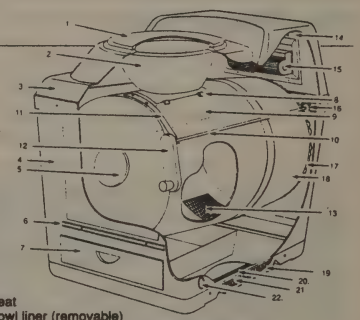
- 4 ea. Arco M-75 (48 watt) PV's or equivalent
- 1 ea. latitude adjustable four-panel mount
- 1 ea. Trace C-30A charge controller
- 1 ea. 60 amp, 2-pole disconnect (safety switch)
- 1 ea. 45 amp fuse
- 1 ea. DC load center w/12 20A fused circuits
- 1 ea. 10-16V voltmeter
- 2 ea. 0-30A ammeters
- 4 ea. 6 volt, 220 amphour deep cycle batteries
- 4 ea. #2 battery interconnects
- 1 ea. Trace 612 12V to 110V power inverter

Sun-Mar Composting Toilets

More aesthetic and capacious than the portapotties used in recreational vehicles, and certainly less polluting and more pleasant than most squat-high-or-die outhouses, the composting toilet has at last achieved official approval (from the National Sanitary Foundation and the Canadian Ministry of the Environment and CSA) in these models. A strong updraft — induced non-electrically in the N.E. model — prevents odors from escaping into the room. Maintenance ritual is easy and acceptable. It is claimed that cold weather, the bane of most composting toilets, will not cause terrible things to occur. Real Goods folks who use it say that it works just fine, though I would be willing to bet that in some locations there will be the usual problems with fly-hatches in the bin. Despite what folks tell you, that problem awaits a foolproof solution. Otherwise, the Sun-Mar looks like what cabineros have been waiting for. —J. Baldwin



The tremendous aeration and mixing action of the Bio-Drum has enabled us to design this exceptional non-electric system. With the help of a 4" vent pipe and the heat from the compost, a chimney effect is created which draws air through the system similar to a wood stove. Although the lack of electricity limits the capacity of the N.E. to 1-3 people in year round use, it is successfully used in cottages by 4-6 people.



1. Seat
2. Bowl liner (removable)
3. Tiolet top
4. Main Shell
5. Drum bearing
6. Step support
7. Compost drawer
8. Drum door hinges
9. Drum door
10. Crank shaft
11. Drum locker
12. Crank handle
13. Drum drain screen
14. Fan mounting plate
15. Fan 30 Watts with speed control
16. Crank sprocket
17. Drum sprocket (moulded into drum)
18. Drum
19. Insulation base
20. Heating element 250 Watts
21. Insulation
22. Vent hole

Sun-Mar Composting Toilets
$1,049 — $1,295 from Real Goods, 966 Mazzoni Street, Ukiah, CA 95482; 800/762-7325 (in CA: 707/468-9214).

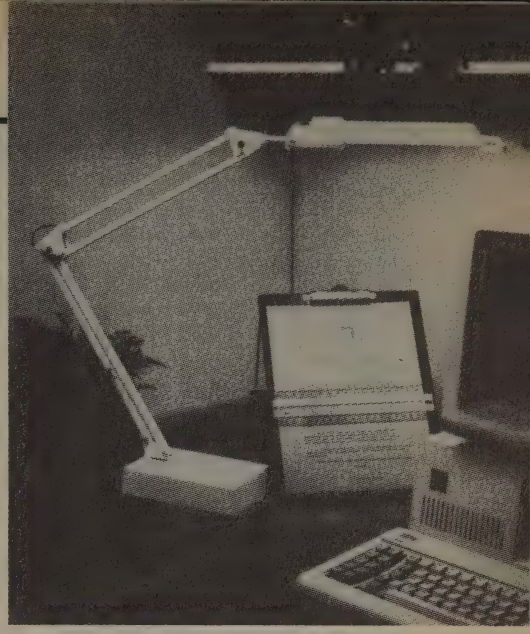
Energy-Efficient Light Bulbs

There are a number of kinds, and it would take several pages to explain them all. The best overall look is to be found in the ***Real Goods Sourcebook*** *(left) and directly from the experts at Rising Sun Enterprises. Most promising are the compact fluorescents, which will serve most needs in a conventional home or business, whether it be powered from the grid or from a photovoltaic array or other alternative-energy sources.*

They are a good deal. A 15-watt compact fluorescent lamp, giving the same light as a 75-watt incandescent bulb, usually lasts more than ten times longer and uses about 75 percent less electricity. Despite the high price of the compact fluorescent, you'll actually make money on it compared to what you'd pay to buy and run regular old energy-pig bulbs. Better, just ***one*** *efficient bulb, over its lifetime, requires about 570 kilowatt-hours less electricity to be generated. If that electricity is made in a coal-fired power plant, that means several hundred pounds less coal needed, about a* ***ton*** *less carbon dioxide — one of the principal causes of global warming — put into the atmosphere, and about twenty pounds of other foulness in the air. That's the effect of just one bulb!*

Besides the higher initial price, what are the disadvantages? Well, I'm typing this by the light of a 15-watt Asymmetria desk lamp. It doesn't hum or flicker, and the light has a nice quality to it. In fact, it seems to be the most glare-free reading lamp I've ever used. But it's a bit slow to start on cold mornings if I've let our wood-heated house go below 40°F, and when it does start after several seconds of blipping, it is rather yellow for a few minutes. If the room is warm, the lamp acts normal.*

Note that these bulbs are not well suited to quick on-and-off duty such as closet lighting; they're at their best in performance, long life, and good economics when used for hours at a time. Some bulbs are too heavy or bulky for use in spring-arm lamps or other fixtures with limited clearance. (The big corporations are on the case, though; Panasonic and Philips, for instance, so I expect a much wider selection soon.) At this time, no compact fluorescents will work on circuits controlled by a dimmer. The jury is still out concerning the health effects of any fluorescent lamp; respectable science is being done on the subject and results should be in soon. In any case, the compact fluorescent has the potential to make a huge difference in energy consumption and consequently in pollution levels and depletion of resources. Why don't you put a few to work? —J. Baldwin



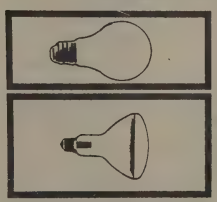
* Beware of fake Asymmetria lamps; they're cheaper for good reason.

Energy-Efficient Light Bulbs
$19.95 — $49.95
Catalog **$3** from Rising Sun, P. O. Box 586, Snowmass, CO 81654.

NEO-White Incandescent Bulbs

White light. Not a psychedelic, just light that isn't yellow. Most incandescent bulbs give off a very yellow light. Most of the time we don't notice; the brain compensates a lot. Sometimes, though, if you're trying to do color work, it can get annoying to impossible. Printers usually have expensive viewing booths to proof color work. These lights fit in standard sockets and will keep your blues and purples from getting muddy.
—Kathleen O'Neill

NEO-White **INCANDESCENT BULBS**



©1987 Dan Kassell, San Francisco, CA 94107

60 watt	FROST	Standard	2000 hrs	$4.75
100 watt	FROST	Standard	2000 hrs	5.00
R20 Frost	50 watt	Standard	2000 hrs	11.00
R30 Frost	100 watt	Standard	2000 hrs	12.50
R40 Frost	150 watt	Standard	2000 hrs	14.00

Shipping adds $2.50, COD adds $2.00

NEO-White Incandescent Bulbs
$4.75 — $14

Catalog **free** from Network Marketing, 25 W. Fairview, Dover, NJ 07801; 800/777-4636.

Solar Radio

With power and phones out during the last earthquake, tiny pocket radios were the sole sources of reliable information. Unfortunately, I was among many in the city without one. A car radio got us through the disaster, inconveniently.

I'm better prepared now. I've got this ever-ready solar-powered radio tucked away near a window. Plays forever during daylight; goes for about five hours in the dark before it needs to be recharged by light. Has AM/FM and a jack for walkman-type earphones. Sound quality is adequate for news. Never needs batteries.

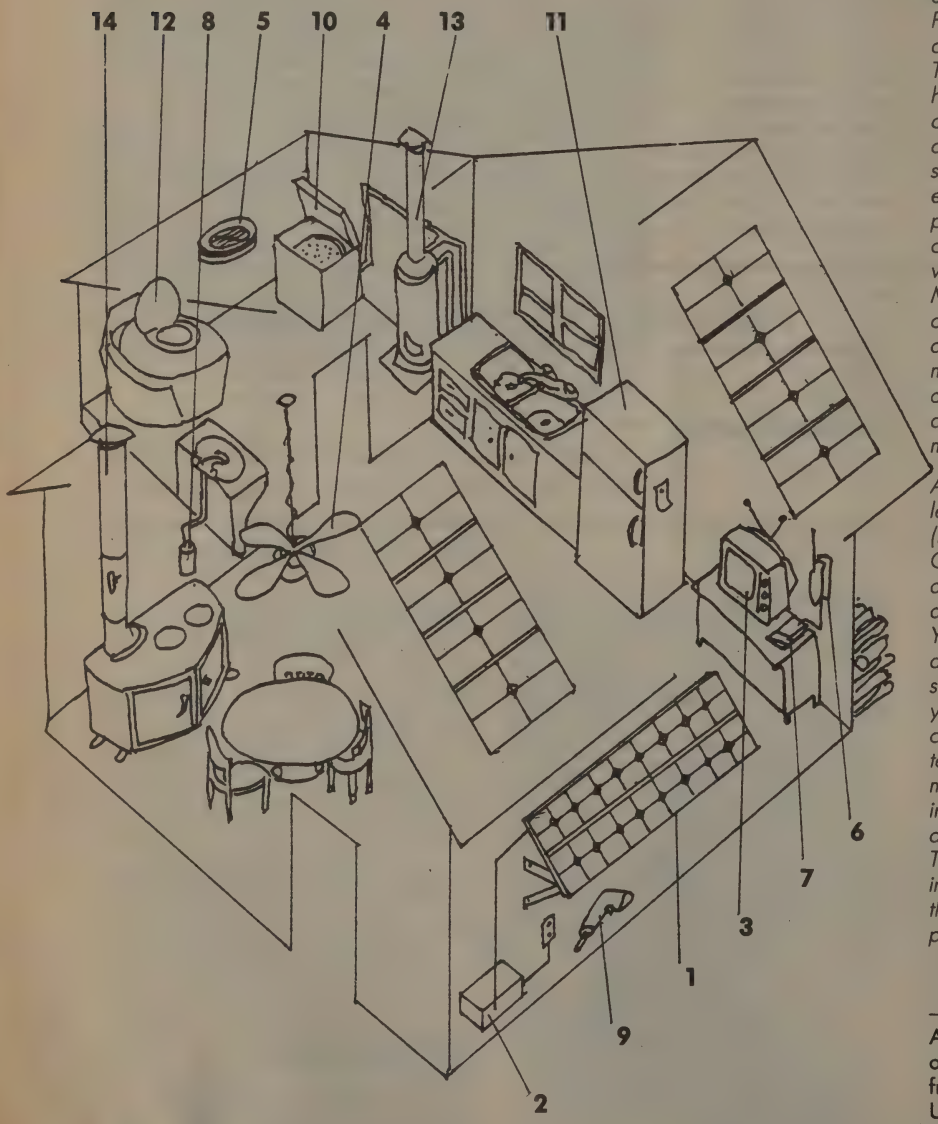
Of course it's useful for more than earthquakes. Batteries can be highly toxic and a landfill hazard because of their heavy-metal components. Why pollute unnecessarily? You can turn this radio on, and leave it on 24 hours a day, and it doesn't consume or cost anything. I have a mad urge to put one outside in the garden, tune it to a classical-music station, and leave it on permanently. —Kevin Kelly

Solar AM/FM Speaker Radio
$19.95 ($24.75 postpaid) from Real Goods, 966 Mazzoni Street, Ukiah, CA 95482; 800/762-7325 (in CA: 707/468-9214).

THE AUTONOMOUS ELECTRONIC COTTAGE *BY J. BALDWIN*

TAKE A HEFTY PORTION OF OFTEN-unrealistic idealism, add a desire (or need) to live in a remote place, stir in lots of effort and Good Old American Ingenuity, garnish with a dollop of courage, and let season about twenty years. Done right, you got a comfortable, practical home that's independent of the commercial power company. The successful handmade homesteads have worked so well that they've created a demand large enough to interest both big-time corporations and new entrepreneurs; the energy-autonomous house can now be equipped off-the-shelf. Let's take a look at what you can do easily and reliably, if not inexpensively, from the selections offered by Real Goods. It's important to remember that even with Real Goods' proven hardware, life will not be as carefree as it is in town. When you are your own power company, there is certain to be a bit of work involved with service, maintenance, trouble-shooting and repair. You can guess who will do it.

First, it should be made clear that with enough photovoltaic panels ***(1)****, batteries, controls (and money), you can have virtually any electric device that you'd have in town. In other words, you can be a photovoltaic energy-pig. An inverter* ***(2)*** *changes the DC energy stored in the batteries into normal 120-volt AC house current. For a price, you can get an inverter that'll run most anything. But that is not what most folks do, because most 120-volt AC energy-using equipment is woefully inefficient. Most folks use a modest inverter to run things that are not available in DC: computers, big stereos, and large shop tools. The rest they run directly from the batteries. Since most battery-operated appliances were originally developed for use in recreational vehicles, they're 12-volt. Real Goods stocks 12-volt TVs* ***(3)****, vacuum cleaners, blenders, microwaves, Casablanca fans* ***(4)****, vent fans* ***(5)****, air conditioners, ice-cube makers, cordless telephones* ***(6)****, and answering machines* ***(7)****. You can get solar driveway lights complete with timer, motion detector, photovoltaic panel and little battery. Your water can be pumped — even from a deep well — with a 12-volt pump* ***(8)****. Makita cordless hand tools* ***(9)*** *can be recharged directly from a 12-volt charger. There's a 12-volt soldering iron and a 12-volt hair drier (though in general it's best not to use battery power for heating). A small washing machine* ***(10)*** *is catalogued. There's even a solar bait-bucket (with its own little PV panel!), 12-volt Christmas tree lights and, egad, a 12-volt chicken plucker. The Big User, your refrigerator, can be had in 12 volts, though some say that it's cheaper to buy more PV panels and run a 120-volt AC model. (My experience says that no 120-volt model is efficient enough.) More common is to use a propane or kerosene fridge such as the excellent Sibir* ***(11)****, and now the revived venerable U.S. brand, Servel. The Sun-Mar composting toilet* ***(12)*** *is the potty of choice. For hot water, you can go to a direct solar heater or a woodburning model* ***(13)*** *— stand-alone or as an addition to your stove. Cooking is done on a woodstove* ***(14)****, propane rig, or Coleman (not offered by Real Goods).*



Add it all up, and you're living well, at least to normal city-power rural standards. (If you live where sunshine is scarce, Real Goods offers wind-electric generator sets and several small water turbines, as well as gasoline and diesel back-up units.) Yes, it'll cost a bit more than equipping a place in town. But in the long run, it should be cheaper — at least it will be if you buy good stuff. And the costs are coming down: time was when a PV system wouldn't pay unless you lived five miles or more from the power poles. Now, in many locations, it'll pay if you live only a quarter-mile from the power company. There are codes now, too. That is annoying to some people, but it also means that banks will give loans on code-approved installations. Good for us. ■

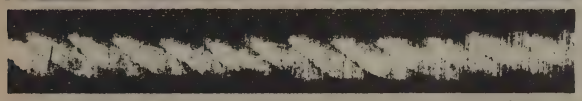
All items above (except where noted otherwise), and more, are available from Real Goods, 966 Mazzoni Street, Ukiah, CA 95482; 800/762-7325 (in CA: 707/468-9214). See p. 64 for review of their catalog.

Memphis Net & Twine

They have the best rope prices & selection that I've found. They ship fast also.
—Douglas L. Milliken

Memphis Net & Twine
Catalog **free**. 2481 Matthews Avenue/P. O. Box 8331, Memphis, TN 38108; 800/238-6380 (in TN: 800/542-5092).

POLYESTER HAMMOCK ROPE



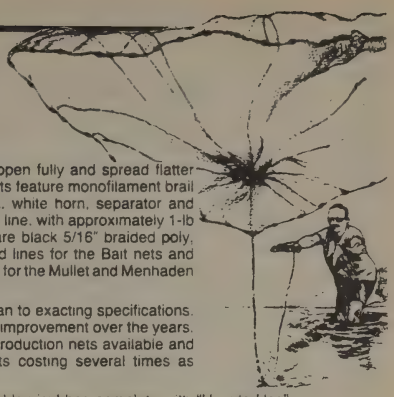
This spun polyester rope is used by most of the major hammock makers. It looks like cotton but lasts longer. 7/32" diameter. White.

Approx Ship Wt. 10-lbs.

	1-3 tubes	4 or more tubes
Stock No. HAM 1,000 ft. tube	**$23.40 ea.**	**$22.23 ea.**

Make Your Own Hammock and Lie In It — Denison Andrews — 120 pages 5½" x 8" — Gives detailed instructions on how to make rope hammocks. **Stock No. BK2** **$3.19**

BETTER GRADE CAST NETS



These nets are designed to open fully and spread flatter than regular cast nets. The nets feature monofilament brail lines, heavy duty 10/0 swivel, white horn, separator and double selvage along the lead line, with approximately 1-lb of lead per foot. Hand lines are black 5/16" braided poly, with approximately 25 ft. hand lines for the Bait nets and approximately 40 ft. hand lines for the Mullet and Menhaden cast nets.

These nets are made in Taiwan to exacting specifications. They are the result of gradual improvement over the years. We believe the are the best production nets available and rival many custom-made nets costing several times as much.

Each net is packed in a reusable vinyl bag complete with "How to Use" instructions.

MONOFILAMENT BAIT CAST NETS

STOCK NO.	RADIUS	MONO NETTING	MESH SIZE SQ.	MESH SIZE STRETCHED	NET EACH	3 or more of a Size Each
CN10A	3 ft.	.32mm	3/8"	3/4"	$17.56	$16.69
CN10B	3.5 ft.	.32mm	3/8"	3/4"	19.70	18.72
CN10	4 ft.	.32mm	3/8"	3/4"	22.89	21.75
CN11	5 ft.	.32mm	3/8"	3/4"	29.55	28.08
CN12	6 ft.	.32mm	3/8"	3/4"	34.88	33.14
CN18	7 ft.	.32mm	3/8"	3/4"	40.72	38.69
CN19	8 ft.	.32mm	3/8"	3/4"	49.95	47.55

The Hardwood Floor Refinisher's Handbook

WHAP!, *flupflupflup. That's the sound of a floor-sander-paper breaking @ $2 each. It can get worse: hit an exposed nailhead and spark off the contents of the sander's dustbag, and you might have to waddle down three flights of stairs clutching the entire 150-lb. burning sander, as I did once, in order to get to a hose. Sheesh! Well, this book will not only keep you from that particular comedy, it will ensure that your goal is achieved with style and grace, if not entirely free of labor. It's copiously (but rather fuzzily) illustrated with photographs and sappy cartoons, redolent with sage advice, and reassuringly festooned with checklists, schedules, time-and-materials estimates, and safety caveats. Would-be floor refinishers have an "uncle in the flooring business" here.* —J. Baldwin

•

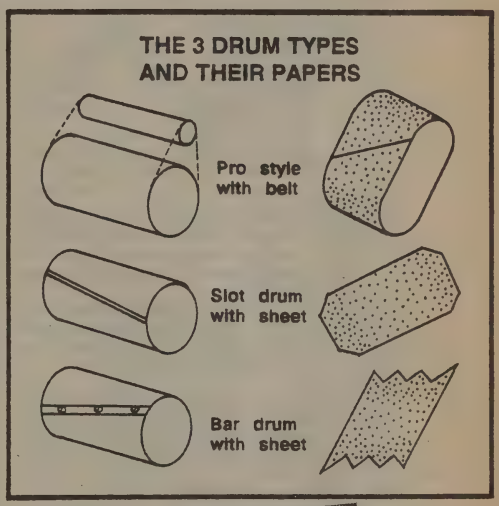
Some rental shops or do-it-yourself experts advise buffing with a steel wool pad, but I recommend against this. Steel fibers get stuck in the floor and finish, and if you use a water base finish, can even rust. Instead, use a sandpaper disc, or if they are available, abrasive screen discs ("sandscreen"). These are circles of material resembling windowscreen, coated with an abrasive similar to that on sandpaper.

►

The least desirable type of drum sander uses a bar to hold the paper on the drum. The bar fits into a rectangular recess in the drum. The paper is wrapped around the drum, with the ends overlapping. The bar is placed on the overlap, and tightened down with a screwdriver or special wrench, securing the paper.

The coarsest grades are the most difficult to correctly mount. Here's a couple of tips that can make it easier. If the sheet is too stiff to easily bend and it cracks, dampen (but don't soak) the paper backing.

If the ends don't easily slide into the slot, lay the paper flat on a hard surface and scrape or hammer the ends of the paper — 1 inch or so. This will remove or crush some of the large lumps of abrasive and let the ends slide in easier.



The Hardwood Floor Refinisher's Handbook
Peter Fahey, 1987; 48 pp.
$6.95 postpaid from 11th Hour Publishing, 4412 Blaisdell Avenue S., Minneapolis, MN 55409; 612/825-3598 (or Whole Earth Access).

A Word on Tapeless Tapemeasures

Borrowing the technology from self-focusing cameras, a number of manufacturers are now offering long-distance measuring devices that free the operator from crawling and climbing around with tapemeasure and ruler. This capability is of most use to those persons who must estimate the square footage of interior areas in order to prepare bids on painting, wallpaper, ceiling tile and the like. A few pokes of the buttons will also yield cubic volume — useful for air conditioning, heating and solar calculations. But for everyday use? Not for me. The devices are typically accurate to about 2 percent, which is not good enough for, say, cutting a wall stud; what good would it be an inch too short? I'd guess that in most tool boxes, a tapeless tapemeasure will spend a lot of time sleeping.
—J. Baldwin

HARDWARE HACKER

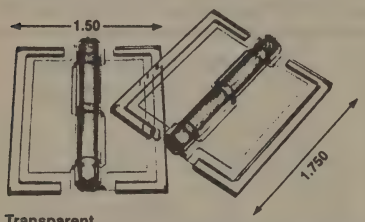
BY DON LANCASTER

Don Lancaster is a pioneer tinkerer who developed a set of "cookbooks" for making your own personal computers in the early seventies. These days he explores cheap ways to hack laser printers. Along the way he's found sources of thingamajigs that WER hadn't known about. He welcomes questions on his free helpline at 602/428-4073. —Kevin Kelly

AIN Plastics
249 East Sandford Boulevard, Mount Vernon, NY 10550; 914/668-6800. Catalog **free.**

This plastics wholesaler has an in-depth selection of engineering and commercial materials. Rigid vinyl is often a good and low-cost choice for modelmaking uses.

ACRYL-HINGE®
NO NEED TO DRILL • BOLT • RIVET



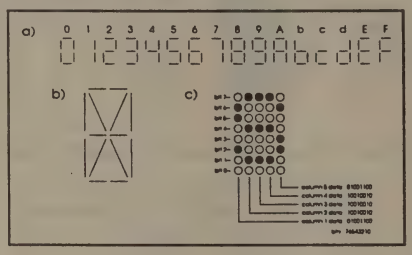
- **Transparent**
  Acryl-Hinges, made of clear acrylic, are completely transparent. This transparency provides a distinct benefit for bulk food bins, safety guards, dust covers, store fixtures and display cases for museums and galleries.
- **Solvent Cementable**
  Methylene chloride, ethylene dichloride and all commonly used solvent and monomeric type cements will bond Acryl-Hinges to acrylic. High strength can be achieved using standard cementing techniques.
- **Ultra Touch**
  Molded of Acrylic DR®, Acryl-Hinges are ten times tougher than regular acrylic. They are strong, light, chemical-resistant and weatherproof. Additional information concerning other properties of Acrylic DR is available on request.

HINGE PRICING PER PAIR

1–49	50–99	100–200
2.49	2.98	1.25

Circuit Cellar Ink
4 Park Street/Suite 20, Vernon, CT 06066; 203/875-2751. **$14.95** year (6 issues).

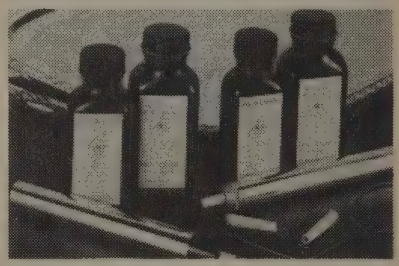
Steve Ciarcia's hands-on answer to my Hardware Hacking columns in ***Radio Electronics****. Very heavy into computer applications, especially embedded microcontrollers. His other emphasis areas include security, machine vision, remote controls, and telecommunications.*



a) By mounting single bar-shaped diodes in the configuration of a number eight, the digits 0–9 and characters A–F can be displayed by turning on the correct combination of diodes. b) Adding seven more segments to a seven-segment display provides the capability of displaying all letters of the alphabet in addition to the numerals. c) A 5x8 matrix can be used to display alphanumeric information.

Edmund Scientific
101 East Gloucester Pike, Barrington, NJ 08007; 609/573-6250. Catalog **$5.**

The yuppie reign of terror here has at long last ended, and the Perrier-filled birdbaths are no more. Edmund is once again a good source of optics, electronic surplus, and scientific stuff. Now has superconductivity kits.

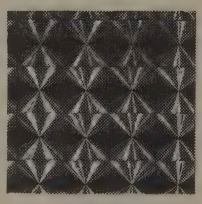


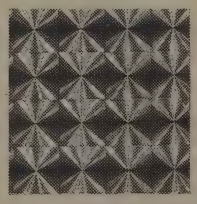
DIP COAT OR BRUSH-ON ELECTROPLATING KITS
Restore scratched or worn jewelry, guns, cameras, trophies, antiques, printed circuits—almost anything made of metal—in minutes with our safe, non-cyanide process electroplating kits. Create your own jewelry. Each kit includes brush and dip-coater heads with anodes, battery case electrolyte (uses "AA" cells, not included), metal polish or conditioner, (to clean surface before plating), wire clip and instructions. Six kits to choose from.

Electroplating		
Silver	B61,003	$36.95
24K Gold	B61,004	$72.95
Chromelike	B61,005	$32.95
Rhodium	B61,006	$105.00
Copper	B61,007	$26.95
Gloss Black	B61,008	$36.95

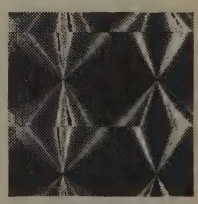
Coburn
1650 Corporate Road, Lakewood, NJ 08701; 201/367-5511. Sample packages **free.**

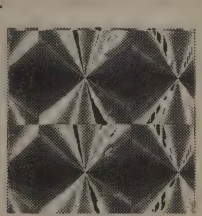
Makes highly unusual and decorative sheet materials, including prismatics, foils, glow-in-the-darks, diffraction gratings, glitters. Some are laser printable; others are not. Sample evaluation packages available.


¼" MOSAIC

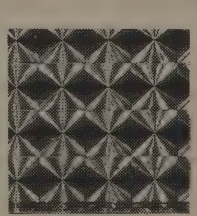

GOLD


PURPLE

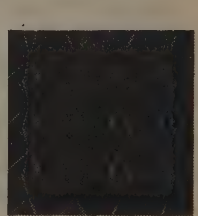

MULTI-COLOR


½" MOSAIC


SMALL FISH SCALE


BRASS


EMERALD GREEN


GALAXY

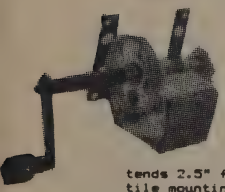
Evergreen Scale Models
12808 Northeast 125th Way, Kirkland, WA 98034; 206/823-0458. Catalog **$1.**

Precut white styrene for modelmaking uses, especially in the sizes favored by architects, model railroaders, and dollhouse builders. Stocked by some larger hobby shops.

Individual styrene strips were used for the porch and porch roof. The strips were heavily wood grained before cutting to the finished length.

Fair Radio Sales
1016 East Eureka Street, Lima, OH 45802; 419/227-6573. Catalog **free.**

The oldest of the old-line surplus houses, still stocking original World War II electronic gear. Particularly handy for older and higher-voltage components, hard-to-get technical info. One of my favorites; I've bought everything from altimeters to servos from them.



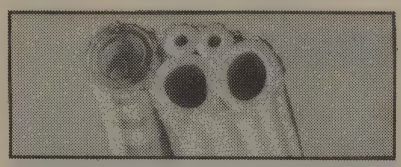
HANDCRANK MAGNETO GENERATOR removed from telephone equipment; features long crank with shaft which extends 2.5" from the generator and versatile mounting plate that allows left or right side or bottom mounting. Use to replace "dead" generator in your antique phone, or as remote signaler (ring bells/buzzers), or as "worm shocker"; 4 lbs sh. #MAG-GEN-1085, used-checked, $15.00

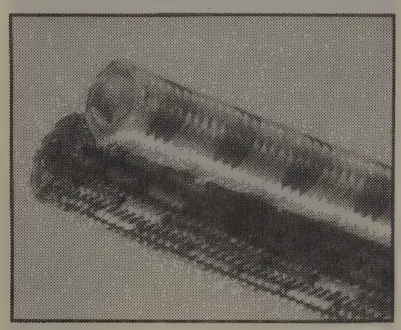
Fomebords
2211 N. Elston Avenue, Chicago, IL 60614; 312/278-9200. Catalog **free.**

Cardboard used to be cardboard and posterboard used to be posterboard, but today there are dozens of hi-tech materials available for architectural studies, models, and exhibits. Great stock selection.

Hygenic Manufacturing
1245 Home Avenue, Akron, OH 44310; 216/633-8460. Brochures **free.**

A great and very low-priced source of rubber tubing and sheeting, as well as doing custom die-cutting. Far cheaper than most electronic materials sources.





Braiding does not affect the natural flexibility of the core material plus it offers these additional advantages: 1) working pressures to 2,000 psi (depending on size and tube/braid material); 2) color-coding for simplified identification; and 3) protection against external abrasion, heat and chemical damage.

Jerryco
601 Linden Place, Evanston, IL 60202; 312/475-8440. Catalog **$ .50.**

The finest mail-order surplus store in the world. Period. Where else can you get a matched set of 24 US Army urine specimen bottles for use as wedding presents? Insanely low prices on many items. Unusual materials for unusual uses. This one is a "must have."

GREEN GLOWER
Looks like a neon lamp, but isn't. A white coating lines the inside of a 3/4" long glass envelope. Put a 50 to 100 k resistor in series and it glows green with 110 VAC applied. Like neon lamps it lasts forever and draws practically no current. We will supply the resistor and a little plastic lens to really jazz up the project. Nice way to have "go" on your project glow green instead of orange. Could it be a mercury lamp? Who knows??
3628 Green Glowers, w/ Parts $2.25/pkg(3)

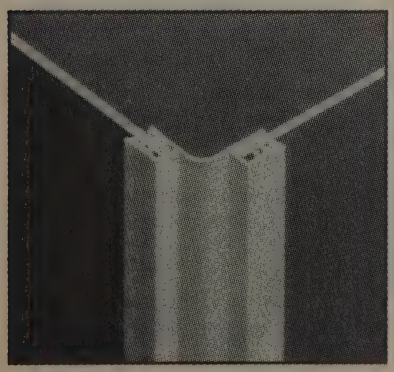
PLAIN VANILLA TEST TUBES
Actually, culture tubes to the semantically correct. These are not heat resistant glass and should not be used in any direct flame. Great for storing and observing cultures, for starting seedlings, for storing stuff, for arts projects, and for generally introducing oneself to the wonderful world of low-temperature chemistry. Sold in boxes of (250).

10364	**Tube, 10mm x 75mm**	**$6.75/box(250)**
10367	**Tube, 12mm x 75mm**	**$7.00/box(250)**
10370	**Tube, 13mm x 100mm**	**$7.50/box(250)**

K & S Engineering
6917 W. 59th Street, Chicago, IL 60638; 312/586-8503. Catalog **free.**

Good source of modelmaking aluminum, stainless, and brass sheet and tubing in small sizes. Has racks in larger hobby shops.

NEW! DOUBLE-GRIP CONNECTING HINGE

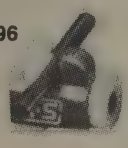


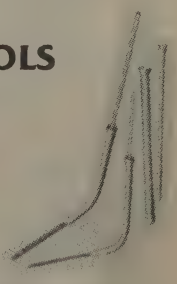
With Easy-On Teeth

This new deluxe panel connecting hinge applies easily to board edges, then grips firmly with special teeth. "Dual Durometer" plastic features strong gripping channels, flexible hinge.

TUBING TOOLS

Stock No. 296





Stock No. 321

Stock No. 296 — Tubing Cutter handles round brass, aluminum, and copper up to 5/8" O.D. Nylon body helps reduce friction. Cuts tubing without crimping.

Stock No. 321 — Tubing Benders handle sizes up to 3/16" O.D. Bends tubing without crimping.

Kepro Circuit Systems
630 Axminister Drive, Fenton, MO 63026; 800/325-3878. Catalog **free**.

Probably the best source for small-quantity experimenter's printed circuit materials and supplies. Use the dry-resist pre-coated boards and their ammonium persulfate etchant for the best results.

STANDARD MANUAL RESIST ETCHED CIRCUIT KITS

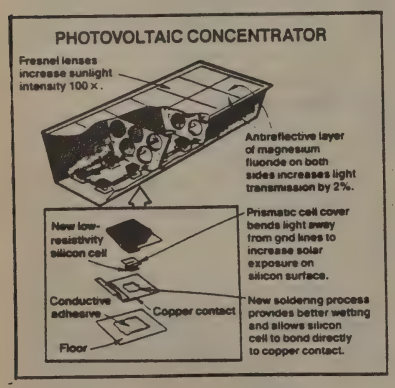
Produce basic PC boards by applying etch resists directly on surfaces of unsensitized boards, then etching. Kit contains three 3"x6" XXXP blanks clad one side with 1 oz. copper, resist ink pen, assorted pressure sensitive terminal circles and conductor strips, graph layout paper, ferric chloride etching solution with tray and cleaning pad to prepare finished board for soldering.

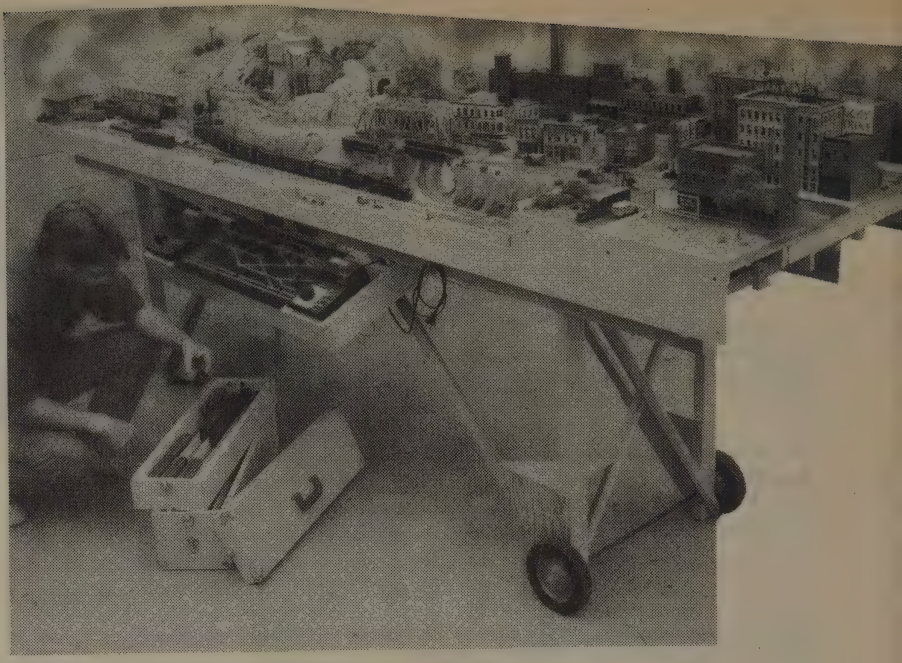
CAT. NO. S-101A
Shpg. Wt.—1 lb., 13 oz. Net Price $9.65

CAT NO. S-101AG
Similar to S-101A but with FR-4,glass epoxy laminate boards.
Shpg. Wt.—1 lb., 15 oz. Net Price $10.50

Machine Design
Penton Plaza, Cleveland, OH 44144; 216/696-7000. Subscription **free** to engineers.

A very good mechanical engineering trade journal. They are fussy about their free subscriptions, so sound like a real engineer when you fill out your qualification card.





Model Railroader
1027 N. 7th Street, Milwaukee, WI 53233; 414/796-8776. **$27.95**/year (12 issues).

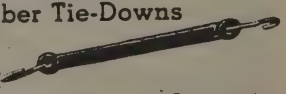
Besides unusual tools and techniques, this hobby magazine has far and away the finest technical writing and technical illustration of any publication anywhere ever. Use it as a style and layout material, and hope to someday be able to communicate that good. Should be required reading for any tech writer.

Bob's layout can be rolled like a giant tea cart. He keeps it in the garage and can roll it outside for photography. Like many model railroaders he has far more cars and locomotives than he can run at any one time.

McMaster-Carr
Box 54960, Los Angeles, CA 90054; 213/692-5911. Catalog **free**.

The super hardware stores that industry shops at. Branches in all larger cities. Try to cop one of their humongous 2400-page catalogs. Stocks at least one each of everything, but does not discount.

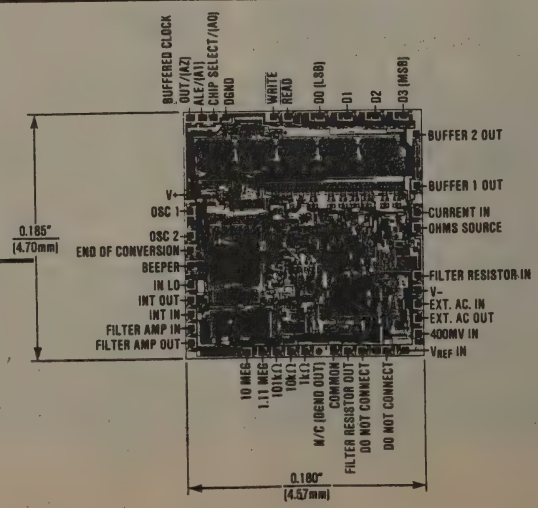
Molded Rubber Tie-Downs



Use to secure tarps, tents, trailers, boxes, and loose tools. Tough, resilient tiedowns molded of special rubber compound that stretches to about 1 1/2 times original length. Resist weather extremes and ozone. High strength hook eyes and plated hooks.

Approximate Length	No.	1-24	NET EACH 25-49	50-Up
6"	3891T12	$0.80	$0.63	$0.55
14"	3891T14	1.16	.90	.79
19"	3891T15	1.29	1.00	.88
24"	3891T18	1.70	1.31	1.13
29"	3891T16	2.00	1.56	1.38
35"	3891T19	2.18	1.69	1.49

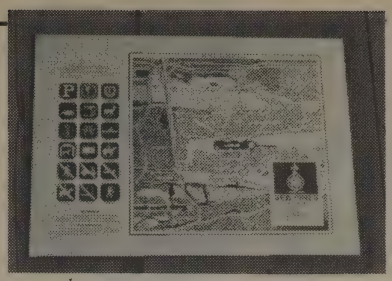
ASSORTMENT: 10 each of every size listed above.
No. 3891T41 ..... NET EACH $76.06



Maxim
120 San Gabriel Drive, Sunnyvale, CA 94086; 408/737-7600. Catalog **free**.

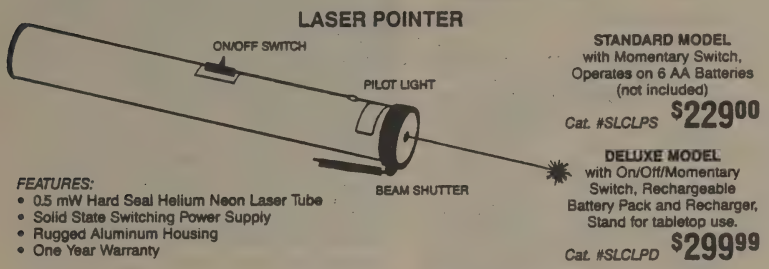
Innovative smaller microchip manufacturer. Unique and low-cost products include video switches, micropower regulators, supervisors, A/D & D/A, power op-amps, lots more. Chips that cry to be used.

Metalphoto
18531 S. Miles Road, Cleveland, OH 44128; 216/475-0555. Brochures **free**.
Manufactures photosensitized and partially anodized aluminum plates. You expose these, develop them, and boil them in sealing glop to make very durable nameplates, front panels, or vandal-resistant interpretive signs.



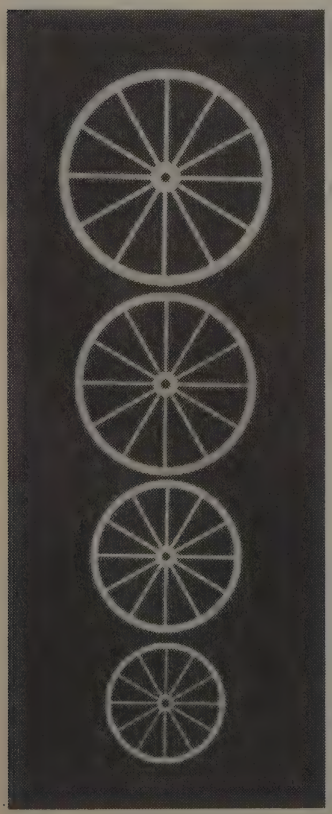
Nuts and Volts
Box 111, Placentia, CA 92670; 714/632-7721. **$12**/year (12 issues).
An all-ads mail-order shopper specifically for hardware hackers, ham radio operators, CB folks, computer users, and satellite pirates. Their low-price ads are attractive for most shoestring technical startups.

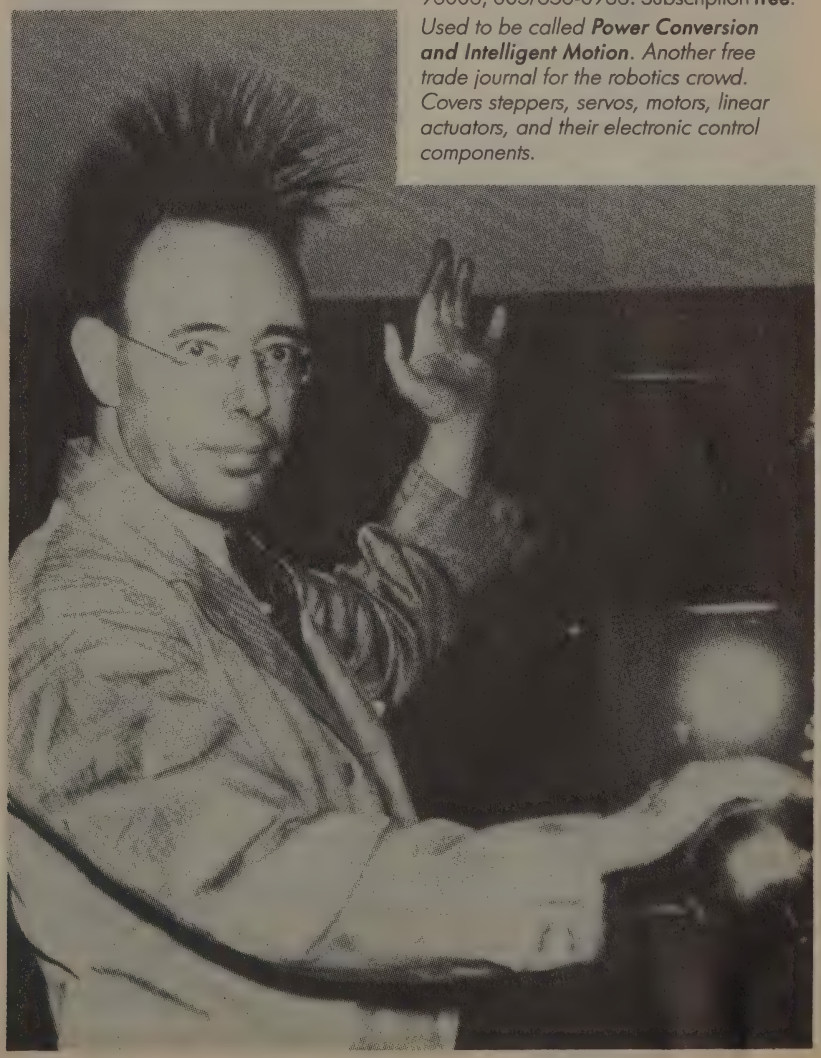
Meredith Instruments
6403 N. 59th Avenue, Glendale, AZ 85301; 602/934-9387. Catalog **free**.
The best hacker source for surplus lasers and related optics. Prices start around $25. Also has a light show BBS up at 602/867-7258.



PCIM
2472 Eastman Avenue, Ventura, CA 93003; 805/658-0933. Subscription **free**.
*Used to be called **Power Conversion and Intelligent Motion**. Another free trade journal for the robotics crowd. Covers steppers, servos, motors, linear actuators, and their electronic control components.*

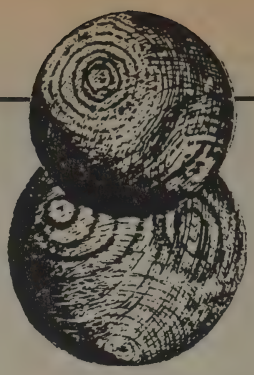
Northeastern Scale Models
P. O. Box 727, Methuen, MA 01844; 508/688-6019. Catalog **$1**.
Precision-precut wood shapes in the sizes used by architects, model railroaders, and dollhouse buiders. Think of them as a miniature lumberyard.





Player Piano Company
704 E. Douglas, Wichita, KS 67202; 316/263-3241. Catalog **free.**

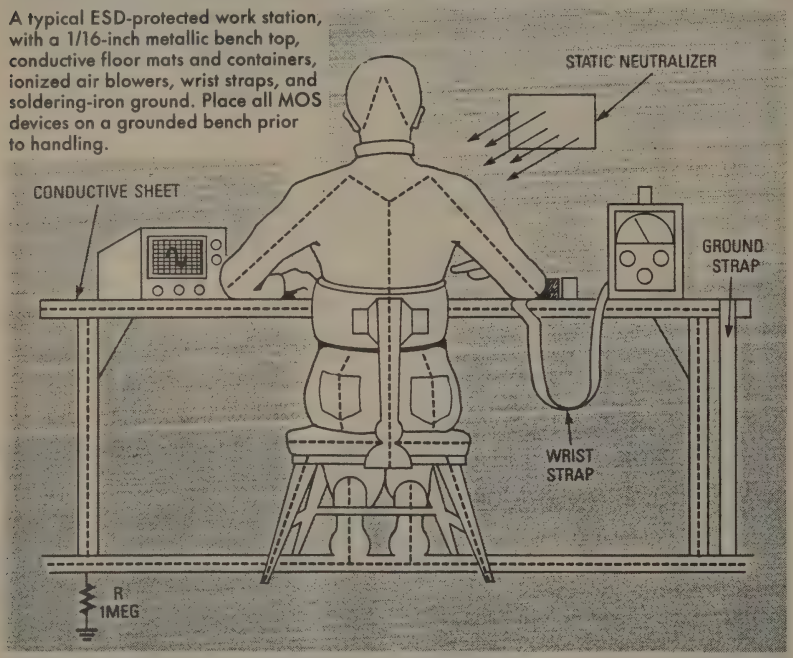
Well, just because it is there, I guess. Unusual source for very unusual tools, materials, and techniques. Has hobby robotics potential, especially for low-pressure pneumatics.



Hardwood Balls
No. 626
1⅛" dia. $ .40
No. 907
1¼" dia. $ .20

Radio-Electronics
500-B Bi-County Boulevard, Farmingdale, NY 11735; 516/293-3000. **$18**/year (12 issues).

Yeah, I write for them. Even so, they are just about the best newsstand electronic mag. They also publish ***Popular Electronics****, which is really the old name wrapped around their own* ***Hands-On Electronics****.*

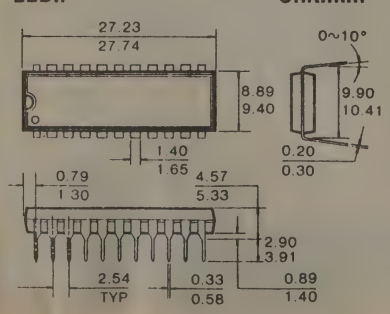


A typical ESD-protected work station, with a 1/16-inch metallic bench top, conductive floor mats and containers, ionized air blowers, wrist straps, and soldering-iron ground. Place all MOS devices on a grounded bench prior to handling.

Samsung Semiconductor
3725 N. First Street, San Jose, CA 95134; 408/434-5400. Catalog/data book **free.**

Distributor of a mind-blowing variety of Korean microcircuits. To any hardware hacker, their data books (especially ***Linear****, Volume I) read like page-turning pulp novels. Their low-cost chips are all "gottahaves."*

22DIP **Unit:mm**



Surplus Traders
Winters Lane/Box 276, Alburg, VT 05440; 514/739-9328. Catalog **free.**

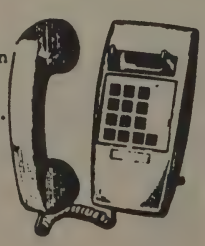
The old ETCO operation set up for direct mail surplus electronics. Ridiculously low prices on many items. As with all electronic surplus, availability is on a catch-as-catch-can basis.

FACTORY BUYOUT

NORTHERN ELECTRIC
TOUCHTONE WALL
TELEPHONES

Standard Canadian made 2554 brown wall telephones. Limited Quantity. VG321

$13 EA/5 LOT



United States Plastics
1390 Neubrecht Road, Lima, OH 45801; 800/537-9724. Catalog **$4.50.**

A good plastics wholesaler with a wide stock selection. Particularly strong on unusual fittings and adaptors you can't find locally.

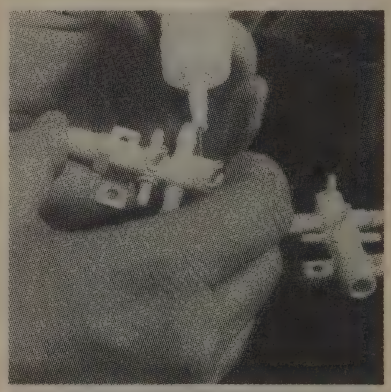
BEL-ART® FLOW INDICATOR

The answer to control problems in cold water flow to distillation and similar apparatus. It is easily connected to water lines in any distillation set-up. As soon as flow begins, the red ball will rotate in the circular channel. The red nylon ball is highly visible.
The speed of the ball's rotation is dependent upon the velocity of flow thereby facilitating regulations.
Made of a glass-clear plastic styrene meteriel, the indicator is 39mm × 57mm × 19mm and has two 23mm long tube extensions to accept(1/4"16mm to (3/8"110mm I.D. tubing.

17240 ..... Price ea.$5.79

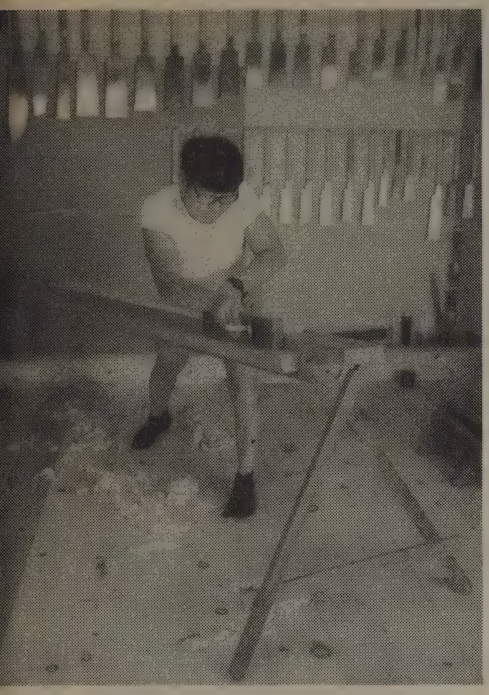
Value Plastics
Available from Parker Hannifin/Paraflex Division, 1300 N. Freedom Street, Ravenna, OH 44266; 216/296-2871.

The pneumatic components for low-pressure robotics are often unreasonably expensive. These folks have lots of cheap connectors and connector systems, including a line of custom you-bond-it manifold kits.



Guy Wicker
30437 Fairfax, Southfield, MI 48076; 313/647-1820. Cold fusion kit **$27** postpaid.

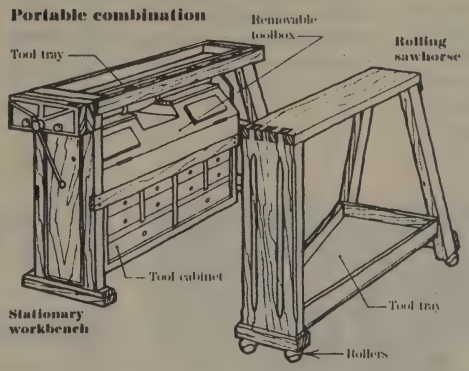
Cold fusion is very much in the news these days. Apparently the excess heat production is real and seems to have an atomic origin. Guy offers very low-cost experimenter's cold-fusion kits and related products. ■

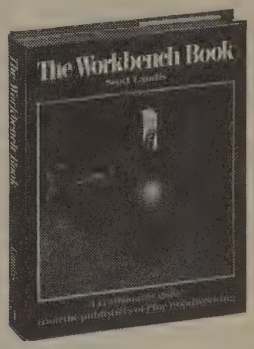


The angled planing beam is the most important bench in the workshop. The beam is supported in the front by a thin, three-slat trestle, and in the back by a short post propped against the wall.

The Workbench Book

This handsome book thoroughly attends the woodworker's bench in its many, often highly individualized guises. There's plenty of tradition-sustaining history, anecdotes, apocrypha, and detail drawings for a variety of benches and vises, ancient and modern. Half-ton monsters resembling beached aircraft carriers share the pages with simple sculptor's stands and deceptively modest Japanese shopware. There's a couple of chapters on vises, including the new-fangled and highly useful Workmate. There's everything you'd want to see drawn or photographed, to the expected Taunton Press standards. A bit specialized, you say? Well, yes, of course; that's the only way to really get into a subject, especially at the level of subtlety needed to illuminate the elusive connection between worker and tool in the creative process. —J. Baldwin





The Workbench Book
Scott Landis, 1987; 247 pp.
$24.95 ($27.45 postpaid) from Taunton Press, 63 S. Main Street/ Box 355, Newtown, CT 06470; 203/426-8171 (or Whole Earth Access).

Designing Furniture

Good design is not revelation, delirium or luck, it is a discipline, and as such learnable. I wish this book had been around 15 years ago when I started down the hard road of the self-taught craftsman; I'm glad it's here at last. —Fletcher Cox

Seth Stem breaks down the design process into six steps which I'll summarize this way:

1. An initial idea leads to a "problem statement," which in turn leads to a plan of attack.

2. Research all aspects of the process by using design aids like the "Dimensional Glossary" in the appendix and by analysis of existing designs.

3. Develop the design to the point where it can be built.

4. Build the piece.

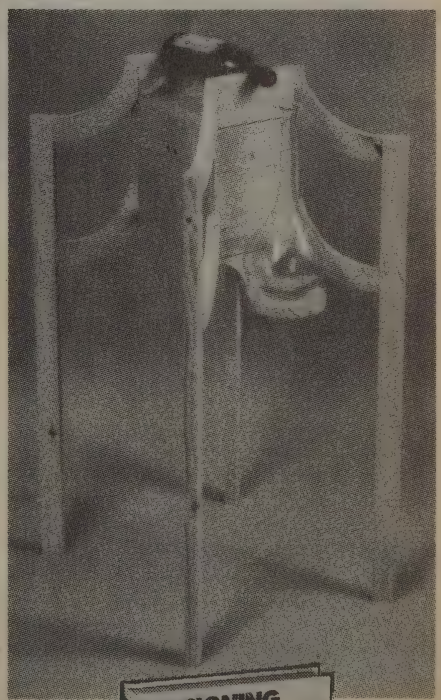
5. Evaluate the completed project.

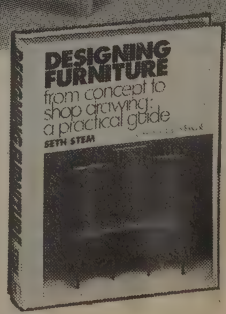
6. Finally, present the (revised) piece in a professional, informative way.

An analysis of the six principles of form goes on all through the book, treating a wide variety of pieces that range from provincial through ultramodern. More than just woodworkers will be interested in this subjective and personal, yet highly instructive book. —Hugh Foster

•

I began work on the study model, using foamcore because it cuts into curves easily yet has enough strength to be self-supporting. . . . After quickly creating a set of scaled drawings for each, I started in on full-scale mockups, using 2x4s and some pine I had around the shop. Using a hot-melt glue gun for assembly, it took me only slightly longer to make the mockups than it would have to put together some models, and I could really tell how things looked and worked.





Designing Furniture
Seth Stem, 1989; 215 pp.
$24.95 ($27.45 postpaid) from Taunton Press, 63 S. Main Street/ Box 355, Newtown, CT 06470; 203/426-8171 (or Whole Earth Access).

The National Parks Trade Journal

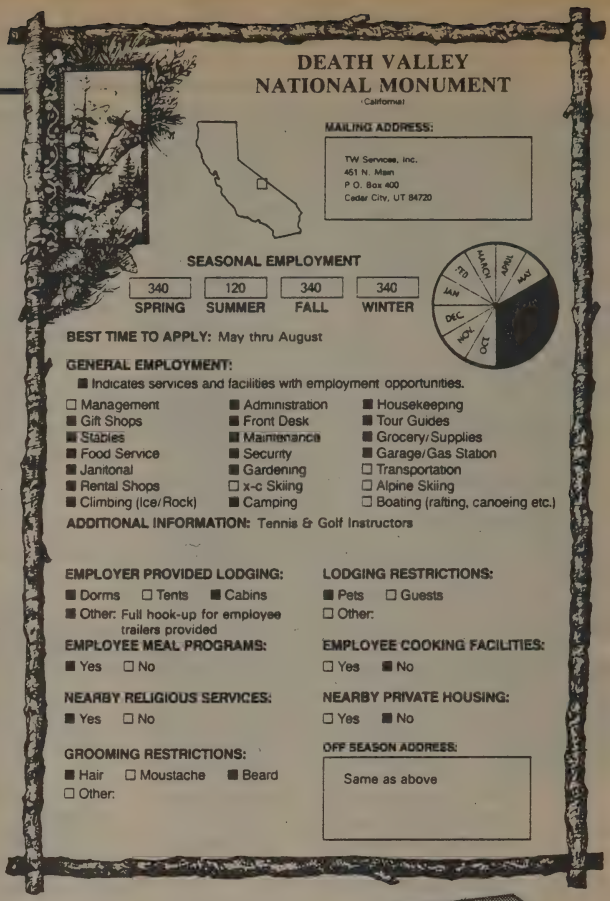
For those of you who missed the first two editions of this sassy publication, it's a book with a magazine's title and contents. Definitely not the official Washington viewpoint, the journal nevertheless offers reliable and detailed park-by-park information that'll help you choose and nab a job in a national park. That'd be reason enough to take the book home, but there's more. Poetry, art, adventure stories, comments on outdoor equipment, and a great selection of advertisements for environmentally Right Stuff is mixed with articles on international environmental organizations. This journal has become a kind of in-house magazine for park workers, but one they want to share with you, inviting you to join their way of life. If you're wondering what to do next, or you've considered maybe working in a park, start reading. Prepare to be seduced. —J. Baldwin

•

National Parks Underwater

The units of the National Park System contain more than 2,250,000 acres of submerged land, an area equal to the size of Yellowstone National Park. Yet we know more about the most remote parts of Yellowstone than we do about these underwater areas. There are 80 parks which lie on or near large bodies of water, including well-known parks like Channel Islands, Isle Royale, Virgin Islands, Cape Hatteras, Biscayne or Fort Jefferson. There are lesser known areas, too, including parks on rivers or smaller lakes.

Reopening streams to salmon and trout migrations along California's North Coast.



DEATH VALLEY
NATIONAL MONUMENT
California

MAILING ADDRESS:
TW Services, Inc.
451 N. Main
P.O. Box 400
Cedar City, UT 84720

SEASONAL EMPLOYMENT

340	120	340	340
SPRING	SUMMER	FALL	WINTER

BEST TIME TO APPLY: May thru August

GENERAL EMPLOYMENT:
■ Indicates services and facilities with employment opportunities.

☐ Management	■ Administration	■ Housekeeping
■ Gift Shops	■ Front Desk	■ Tour Guides
■ Stables	■ Maintenance	■ Grocery/Supplies
■ Food Service	■ Security	■ Garage/Gas Station
■ Janitorial	■ Gardening	☐ Transportation
■ Rental Shops	☐ x-c Skiing	☐ Alpine Skiing
■ Climbing (Ice/Rock)	■ Camping	☐ Boating (rafting, canoeing etc.)

ADDITIONAL INFORMATION: Tennis & Golf Instructors

EMPLOYER PROVIDED LODGING:
■ Dorms ☐ Tents ■ Cabins
■ Other: Full hook-up for employee trailers provided

LODGING RESTRICTIONS:
■ Pets ☐ Guests
☐ Other:

EMPLOYEE MEAL PROGRAMS:
■ Yes ☐ No

EMPLOYEE COOKING FACILITIES:
☐ Yes ■ No

NEARBY RELIGIOUS SERVICES:
■ Yes ☐ No

NEARBY PRIVATE HOUSING:
☐ Yes ■ No

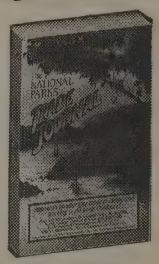
GROOMING RESTRICTIONS:
■ Hair ☐ Moustache ■ Beard
☐ Other:

OFF SEASON ADDRESS:
Same as above

The National Parks Trade Journal

Dave Anzalone, Editor
1984, 1989; 345 pp.

$12.95 ($14.50 postpaid) from National Parks Trade Journal, Wawona Station, Yosemite National Park, CA 95389; 209/375-6552 (or Whole Earth Access).



Guide to Cruise Ship Jobs

I know a man who has been all over the world on an ultra-luxurious cruise ship. He meets lots of interesting people (mostly upper-class, obviously), eats the finest cuisine, sees nightly dance shows, and makes a satisfying amount of money. His job? Dancing partner for ladies traveling alone. He also has to smile a lot, chat pleasantly, and generally be nice. The same ship hires a wide assortment of people — everything from plumbers to bed-makers. Working conditions tend to be unusual for landlubbers: a seven-day week, sometimes at odd hours. For many jobs, pay is mostly tips, but that can be plenty. So how do you get on board? Start with this guide. Just as you'd hope, it describes the general scene, then gives lots of advice on how to approach the ships and companies whose addresses are listed. Hmmmmm, they hire plenty of over-40's people as shore-tour lecturer/guides. Wonder if I'd have to waltz? —J. Baldwin

•

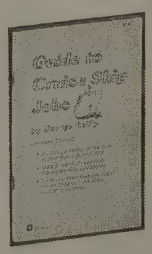
Waiters, Waitresses and Busboys. These individuals are on the front line in the dining room. Most are experienced and have pleasant personalities. Of all the crew who are remembered by passengers after the cruise is over, the server and busboy head the list.

On most cruise ships, they receive a token wage, usually $50.00 or $100.00 per month, and work primarily for gratuities. The suggested tip for a waiter/waitress is usually two to three dollars per day per person, and for a busboy, one to two dollars per day per person. If a dining room table has six persons on a one week cruise, that table would probably tip a minimum of $126.00 for the server, and $63.00 for the busboy. Multiply that number by the amount of tables served and the total amounts to a good income, especially when you consider that their room and board is included in their salary.

•

Will I have the opportunity to bring my family or friends on for a cruise from time to time?

All cruise lines, after a certain time on board, will allow you to bring guests. The length your guests can remain will vary from cruise line to cruise. In most cases, immediate family will be able to cruise free and only pay port tax, or they will be charged a very nominal fee. Many lines will allow friends to cruise at a reduced rate. This also varies from line to line, but in most cases probably will not exceed more than forty dollars per day plus port tax.



Guide to Cruise Ship Jobs

George Reilly, 1989; 45 pp.

$3.95 ($4.95 postpaid) from Pilot Books, 103 Cooper Street, Babylon, NY 11702; 516/422-2225.

Evaluating an Overseas Job Opportunity • Overseas Employment Newsletter

Oh, those ads for jobs overseas! Adventure! Fabulous Pay and Amazing Tax Breaks! Rapid Advancement! Exotic After-Hours Amusement and Companionship! Like all things that seem simple, those ads leave out some important details, just about all of which are discussed in ***Evaluating an Overseas Job Opportunity****. Read this brief pamphlet first if you're being tempted. Then take a look at the* ***Overseas Employment Newsletter*** *for a listing of major U.S. firms currently offering overseas employment.*

—J. Baldwin

•

A few years ago, when the dollar was the world's number one currency, you could be fairly confident that an overseas position would provide both an excellent standard of living and a nice nest egg with which to return home. This is no longer true. Not only have many companies become much less generous in rewarding their overseas employees, but domestic and overseas inflation decreases many benefits, as, in some instances, do new U.S. tax laws concerning Americans working abroad.

•

If you can establish *bona fide* residence in a foreign country for a complete taxable year you may exclude $70,000 of earned income abroad when you file your U.S. tax return. If you wish to establish a physical presence, you must be in the foreign country for 330 full days. However your U.S. tax bracket is based on total income, not withstanding your exemption.

•

Lack of Job Opportunities

For the spouse who had a career in the U.S., the overseas move can be a real sacrifice. The language barriers may make it difficult to pursue a career or find a job with the same opportunity and challenge.

If the prospect of two or three years at home without an outside career is distasteful to your spouse, then it makes sense to determine what opportunities exist and try to have a definite position arranged.

When transported to a foreign location, some people can be overwhelmed by a new language and customs. Some people welcome this challenge. Others are afraid. Both you and your spouse must evaluate your ability and desire to cope with culture shock.

•

Distance Barriers

"Nobody tells us anything, and nobody listens to us!" Mitch Jackson, General Manager of a French subsidiary, complained about communicating with his Pittsburgh headquarters. "They might as well be on the moon. I've sent them memos by the dozen but they go ahead and implement changes against my advice. It may make sense from a corporate viewpoint, but it doesn't make sense for us. Things get badly distorted. You send off a message with the best of intentions, somebody in Pittsburgh misinterprets it, and you're in hot water!"

—Evaluating an Overseas Job Opportunity

•

Secretaries — Overseas

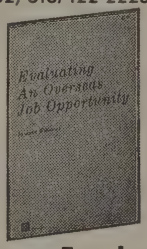
An international organization in the aviation field with headquarters in Paris is seeking a bilingual Secretary, English mother tongue with good written and spoken French to work at Director level. Candidates should have 3-5 years experience with English and French shorthand and knowledge of word processing (Word 4). Candidates must be willing to work flexible hours. They are offering an attractive salary and varied fringe benefits. Reply enclosing your resume and photo to: Media-Systems, 6 Impasse Des Deux Cousins, 75849 Paris Cedex 17 France. Quote reference 72497.

—Overseas Employment Newsletter

Evaluating an Overseas Job Opportunity

John Williams, 1990; 38 pp.

$3.95 ($4.95 postpaid) from Pilot Books, 103 Cooper Street, Babylon, NY 11702; 516/422-2225.



Overseas Employment Newsletter

$108/year (26 issues); **$39**/3 months (6 issues) from P. O. Box 460, Town of Mount Royal, Quebec, Canada H3P 3C7; 514/739-1108.

Work With Passion

This book is full of inspirational, practical, do-able advice, on how to find the work you love and the people who will pay you to do it. It won't find you a job overnight (unless you're incredibly lucky), but it will change job-hunting from pure drudgery to a joyous discovery of the best in the people you meet. I was skeptical of the formulaic instructions, at first, but the ones I've tried have brought results every bit as good as the author (a professional career consultant) predicted. This is a great reference book, not only for job-hunters but for anyone who wants the ability to have more comfortable and interesting conversations. Highly recommended — buy two, and loan one to a friend. *—Karen Summerly*

•

"Mr. Blotnick found that the people in his study who achieved great wealth did so in two distinct stages. In the first stage, those who eventually became millionaires were not investors in the conventional sense of the term. During this stage their major investments were in themselves. This dedication paid so handsomely that they became active investors out of necessity. By this point they had accumulated so much wealth it could not effectively be invested in themselves, and hence they turned to more conventional investment outlets. . . .

"A characteristic goal of those who failed in their quest for riches (92 percent of the participants) was to someday make enough money so that they could quit their job and do 'what I really want to do'. Their attempts to accomplish this goal involved seeking 'get rich quick' formulas that would rescue them from what they viewed as occupational drudgery. In effect, they tried to achieve the second stage success as investors first, in order to finance their quest for activities they would find deeply absorbing, which is stage one."

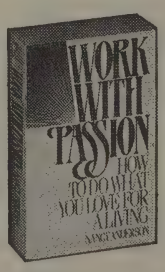
—Gaylon Greer

•

Passion Secret #4: Powerful people always have other powerful people help them achieve their goals.

•

The majority of the jobs involving judgment (sometimes called management positions) are never announced, nor are they advertised. Fully 85 percent of all good jobs are *never* advertised. Where are they? As we said earlier, the jobs are where the problems are, in the minds of the owner or manager or executive — the decision-maker who is trying to solve his or her problem.



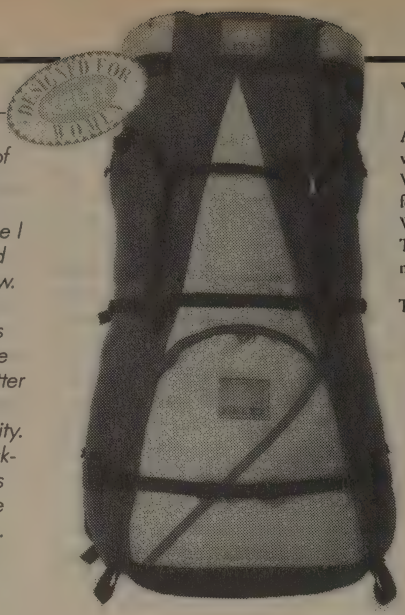
Work With Passion

Nancy Anderson, 1984; 304 pp.

$9.95 ($10.95 postpaid) from Carroll & Graf Publishers, 260 5th Avenue, New York, NY 10001; 212/889-8772
(or Whole Earth Access).

Kelty Women's Packs

For years as I backpacked each step I took was accompanied by the bump of my backpack on the back of my head. Backpacks just weren't designed for a woman's body. I put up with it because I thought I had no alternative if I wanted to backpack. That was then; this is now. Kelty has developed a whole line of internal- and external-frame backpacks especially for women. The frames have been curved to fit a woman's body better and the pack bag is set lower on the frame to match our lower center of gravity. If you're a woman who loves backpacking but hates the way traditional packs fit, try a Kelty woman's pack. No more bump, bump, bump as you walk along.
—Betsy Spetich



Woman's Track Pack 4500

Any model Track Pack quickly converts to a custom-fitting woman's pack by interchanging the waistbelt. The Woman's Waistbelt is narrower, and cut with an additional conical flare for even load distribution across a woman's hips. By adding the Woman's Waistbelt, then making a quick adjustment of the Fast Track suspension to fit your torso length, women will have the most comfortable internal frame pack they've ever worn.

The Woman's Track Pack has all the features as listed on p. 13.

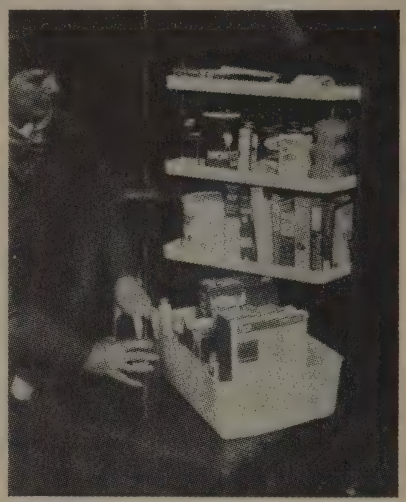
Kelty Woman's Track Pack 4500
$240; catalog **free** from Outdoor Outlet, 1062 E. Tabernacle, St. George, UT 84770; 800/726-8106.

Sturdy nylon straps securely hold cover.

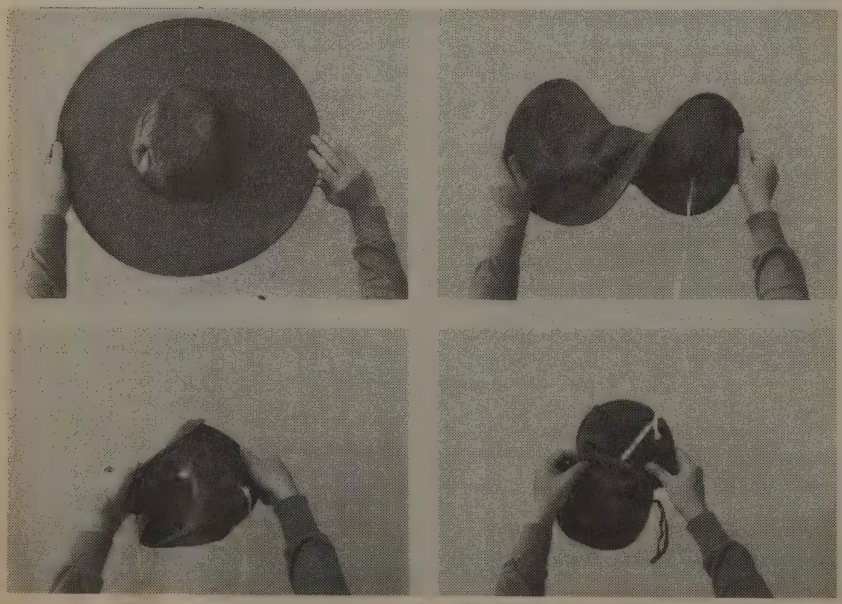
E-M Wanigan

No more soggy sleeping bags and food! This sturdy, watertight plastic cargo box fits nicely in the bottom of your canoe where it also provides emergency flotation. Padded shoulder straps make those hateful portages a bit less hateful. Ashore, it becomes a bear-resistant pantry or a table. Good idea. *—J. Baldwin*

E-M Wanigan
$135-$142.50 postpaid; brochure **free** from Egge-Morgan Wanigan, 10411 Kelman Court N., Stillwater, MN 55082; 612/426-3731.



The Egge-Morgan Wanigan is a weather-tight pantry or a carry-all.



Twist-A-Hat

There's a bit of magic-show in this, the way an eighteen-inch-diameter sun hat literally leaps from a lightweight cloth pouch only six inches in diameter and a half-inch thick. Puts me to mind of those cornball canned snakes, especially when first-time users inevitably shriek as the hat instantly appears. It's a nice hat, too — stylish and colorful, though I suspect not universally appealing as male attire. When you don't need the hat any more, a twist of the wrist — the same twist shop workers use to coil bandsaw blades — puts it back in the easily stashed pouch. Instant shade without awkward hassles, a good idea in these times of skin-damage fears. *—J. Baldwin*

Twist-A-Hat
$9.25 postpaid; brochure **free** from Proma Connection, P. O. Box 79274, Los Angeles, CA 90079; 800/446-4705.

Outdoor Wilderness Fabrics

Repairing your outdoor gear or making your own from scratch is hard if you don't have access to materials — an inquiry for Gore-tex at your local fabric store is apt to draw a blank stare. Outdoor Wilderness Fabrics has the right stuff.

—John Benecki

WATERPROOF/BREATHABLES

				RTL.	WHLS.
Gore-tex:					
3-ply	43 in.	Taffeta	Raspberry, Teal	$18.38	$13.53
3-ply	43 in.	Taslan	Camo-WWII w/green ~~, Silver grey~~	$18.38	$13.53
2-ply	58 in.	PolyNylon/Tactel	Magenta & Grape	$18.45	$13.84
2-ply	45 in.	Ripstop	Yellow	$18.45	$13.84
2-ply	60 in.	Taslan	Camo-WWII Brown	$18.45	$13.84
~~2-ply~~	~~60 in.~~	~~Typhoon~~	~~Rust~~	~~$18.45~~	~~$13.84~~
2-ply	58 in.	65/35 Pop. Biblend	Pacific Blue	$18.45	$13.84

Gore-tex is a multi-laminate fabric in either 2 or 3-ply, a highly waterproof, breathable, abrasion resistant fabric; working well for jackets, rainwear, tents, and any water proof / breathable application. Our stock depends on your needs. Please ask!

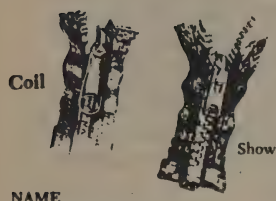
				RTL.	WHLS.
Ultrex 100% Nylon-Tactel Fiber					
59-64 in.		Taslan	Black, Carribean, ~~Cobalt~~, Charcoal, Jade, Navy, Red, White, Yellow, Blaze Orange	$ 9.00	$ 6.75

Ultrex is a waterproof, breathable fabric with a micro-porous coating. These micropores are so small the rain & wind do not pass through, yet large enough to permit perspiration vapor molecules to escape; yet retaining much of the bodies warmth. Ultrex is soft and drapable with DWR finish.

				RTL.	WHLS.
Bion II:					
58 in.			Peach	$15.50	$11.63
~~58 in.~~	~~2 way stretch~~		~~Red~~	~~$18.45~~	~~$13.84~~

Bion II is a coating, not a laminate and it is "monolithic", not porous. It is absolutely waterproof, and also able to attract heat and water vapor like a sponge. Bion II Coating is extremely elastic, able to stretch up to ten times its normal length which enables it to be made with a very thin coating without worrying about rupturing. Bion II has a nice feel, good durability and is flame retardant. Uses are the same as Gore-tex. Stretch Bion II is especially good for stretch inserts used in skiwear and other applications where flexability is essential.

YKK ZIPPERS



NAME	RTL.	WHLS.
Continuous Coil Zipper:		
# 5 sold by foot	.24	.15
# 7	.29	.18
#10	.48	.29

Closed One End Zipper:	RTL.	WHLS.
Coil:		
# 3 16" ST L	.49	.30
Tooth:		
# 5 6" ST L pocket black & navy	.64	.40
# 5 14" ST L	1.23	.76

Outdoor Wilderness Fabrics

Catalog **free** from Outdoor Wilderness Fabrics, 2511 Latah Drive, Nampa, ID 83651; 208/466-1602.

Campmor

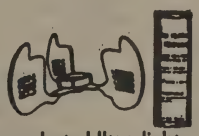
Need a new tent? Campmor has over 100 different models, not to mention 70+ sleeping bags and packs ranging from tiny to 6,090 cubic inches. Also hard-to-find items like cordura, canvas, and mosquito netting by the yard, and spare parts and accessories for cookstoves and other camping paraphernalia.

—Jan Axelson

Campmor

Catalog **free** from Campmor, 810 Route 17 N./P. O. Box 997-N, Paramus, NJ 07653-0997; 800/526-4784.

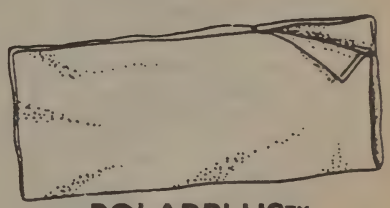
POCKET WING STOVE



Folds flat and fits in a pocket. Ultra light. Supplied one tube of six fuel tablets.
No. 80340-R Wing Stove Wt. 2.5oz. **$1.50**
No. 80332-R Extra Fuel Tablets (6) **$.60**

CAMPMOR "JET" TRAVEL PACK

Main compartment sized to fit under airline seats. Removable daypack front pocket. Unzip the back and it converts from luggage to an internal frame pack, with a parallel stay suspension. Leather handle. Full zipper access to the main compartment. Volume: 3450 cubic in. Wt: 3lbs. 8oz., Fabric: 11oz. Cordura nylon, Main compartment: Ht: 22" W: 14" D: 9". Daypack/front pocket; Ht: 20" W: 9.5" D: 3.5". Color: Navy, Black, Grey. Made in USA.
No. 60751-R **$84.99**



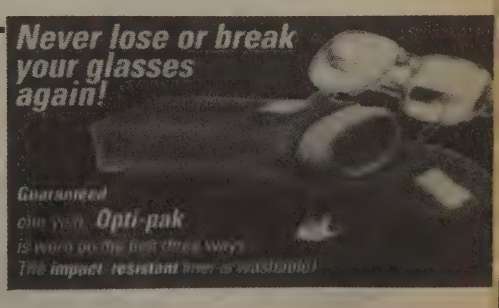
POLARPLUS™ RECTANGULAR SLEEPING BAG LINER AND BLANKET

Made of soft luxurious, but strong Polar Plus, this liner adds warmth and comfort to your sleeping bag. It can also be used alone in summer conditions. Unzipped it opens as a blanket for home or camp. Great as a stadium blanket. Two sewn in elastic loops at bottom keeps liner rolled shut when not in use. Color: Red. Dimensions 70"x28". Wt. 2lbs. 8oz.
No. 41280-R **$39.99**

Opti-pak

*I confess to being a notorious trasher of eyeglasses. They get sat upon, munched in hugs, left where I laid them just for a second in the restroom of the restaurant 80 miles back, or they fall (for the two-hundred and thirty-eighth time) from the breast pocket of my T-shirt — usually to expire with the familiar, terminal clink or splash. I've tried every imaginable case, but they're either awkward to use or little more robust than the glasses they are supposed to protect. Opti-pak to the rescue! The liner is soft, non-scratching, washable material reminiscent of an athletic sock. It's surrounded by a rhinoceros-proof hard plastic shell, which in turn is encased in a classy cordura nylon sack in your choice of colors. You can sneak a ballpoint pen between the sack and the hard shell. The sack can be rigged onto your belt horizontally, vertically, or dangled from a sewed-on loop. Some people might find the case to be a bit bulky, but that's the usual price for armor. If your glasses get broken in **this** pouch, you'll probably be needing a few repairs yourself.*

—J. Baldwin

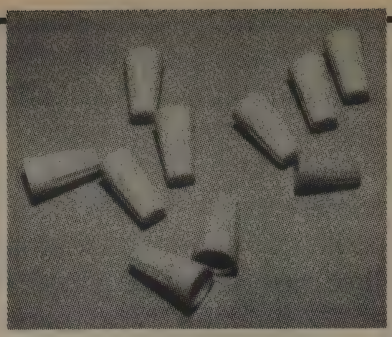


Opti-pak

$25 postpaid from El Rancho Conejo Inc., P. O. Box 570, Penngrove, CA 94951; 707/664-0330.

How to Buy Car Stereo

Who the hell cares about buying an expensive whomp-bass car stereo? Not me, certainly, and I was about to consign this book to our reject purgatory when the teenaged son of a colleague happened by to ask me what I thought of the thousand-dollar stereo he was considering (for his eight-hundred-dollar pickup). He came to the wrong man — I don't know much about stereos for cars, preferring to drive in silence. But ol' JB loaned him this here book. It's marvelously subjective, excessively detailed with obscure (but important) facts, and it suffers from the author's tendency to bury the facts in anecdote. But the stuff you need to know is there, enough to get you started towards an intelligent choice of system and installer. If you just sit down and read the whole thing, you'll probably know more about car stereo than most salespeople; for sure you'll know enough to more than hold your own among your friends as the local expert. —J. Baldwin



If you see an installer using these, run, do not walk to another shop. They are wire nuts, and have no place in car stereo.

How to Buy Car Stereo
E. Duval Kopf, 1989; 300 pp.
$19.95 postpaid from Gray Publishers, 703 Broadway/Suite 1, Tucson, AZ 85719; 800/234-8289.

•

The brain is prejudice to the mid-range because that is where human speech falls. The bass and high frequencies can be less precise, and still be pleasing to the brain, but the mid-range, especially the vocals, have to be right on. This is why I like the separates approach so much. You can pick the woofers and tweeters quickly and easily. This allows more time and money for the mid-range.

The Student Pilot's Flight Manual

Of the many flight manuals I've plowed thru in 25 years of flying, William Kershner's have always struck me as being the most readable and informative, and since this one is now in a seventh printing of a fifth edition dating back to 1960, it's safe to say the rest of the world agrees.

The manual was designed to get you thru the private pilot's license, but it's good enough to qualify for additional use, such as cramming for the biennial exam, or just browsing if you're curious about how aircraft work and what the rules are for flying them. Needless to say, any ultralight pilot would do well to study it.

Kershner also puts out manuals for advanced pilot, flight instructor, and instrument pilot, should you be ambitious.
—Dick Fugett

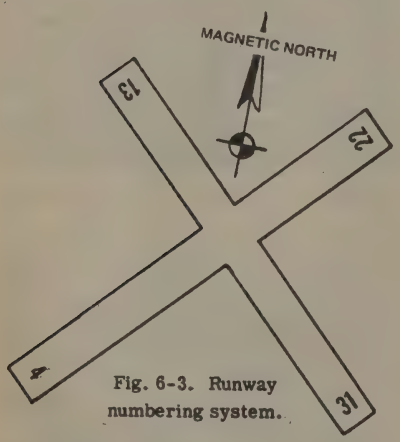


Fig. 6-3. Runway numbering system.

Incidentally, hard-surfaced runways are numbered by their magnetic headings to the nearest 10°. Runway 22 means that the plane's magnetic heading on this runway will be about 220° when taking off or landing. The actual heading may be 224°, but it is called 22.

Some students remember the correct way to use the windsock at first by thinking of the plane as being blown from a trumpet. Think of the tee as an airplane. The way it's heading is the way you want to take off and land. The tetrahedron is an arrowhead pointing the way for you to take off and land.

•

The high-altitude emergency gives you more time and a greater choice of fields. In earlier stages, however, this is a handicap, so practice is usually reserved for the post-solo period. The average student, when given his first high-altitude emergency, is as busy looking around as a one-eyed man watching a beauty contest. There are *too many* places to land. He may get confused and change his mind on the choice of a field several times and finally end up too low to do anything but land in the worst field within a 15-mile radius.

Fig. 6-1. Airport wind indicators.

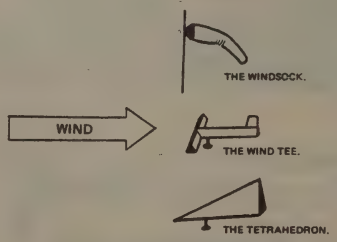
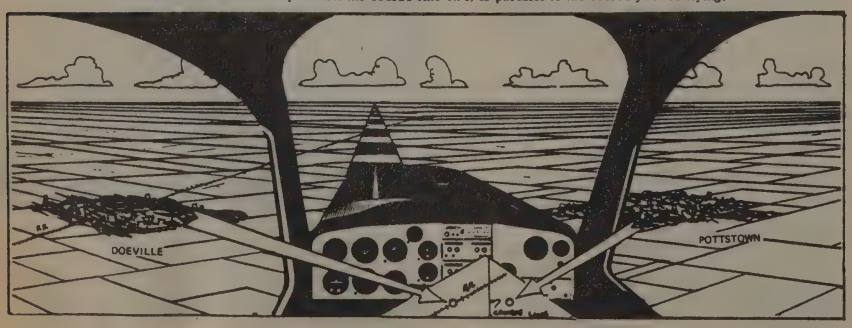
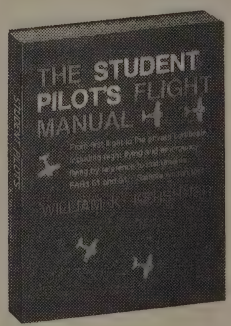


Fig. 25-2. Hold the map so that the course line on it is parallel to the course you are flying.



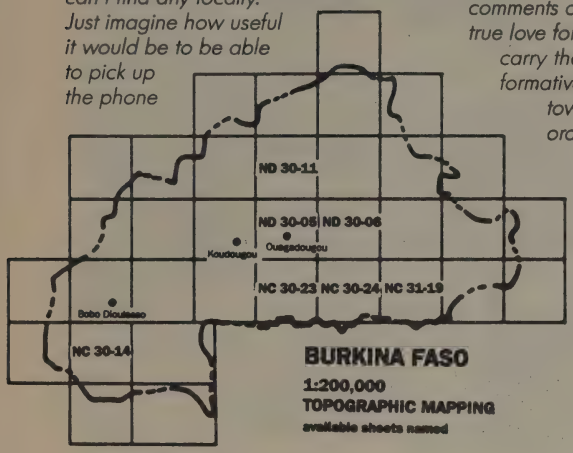


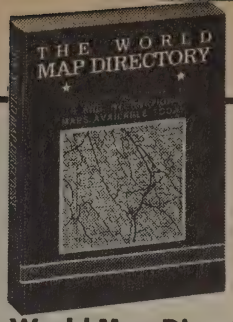
The Student Pilot's Flight Manual
William A. Kershner, 1960; 273 pp.
$19.95 ($21.95 postpaid) from Iowa State University Press/attn.: Order Dept., 2121 S. State Avenue, Ames, IA 50010; 515/292-0140.

Maplink

Suppose you're setting off on a trip to the mountains of Mexico and want a map for the region you're going to. You know that there are 1:250,000-scale topographic maps available, but you can't find any locally. Just imagine how useful it would be to be able to pick up the phone and order the map you need with only the coordinates of the town you're visinting, no catalog number or other information necessary. Such a service is offered by Maplink. They also have an impressive directory of maps from all around the world, with short but detailed comments on each series that display a true love for the subject. They seem to carry the largest-scale and most informative maps available for both towns and regions. The mail-order service was excellent.

—Jonathan Evelegh





The World Map Directory
Aaron Maizlish and William S. Hunt
1990; 278 pp.

$29.95 postpaid from Maplink, 25 E. Mason, Santa Barbara, CA 93101; 805/965-4402.

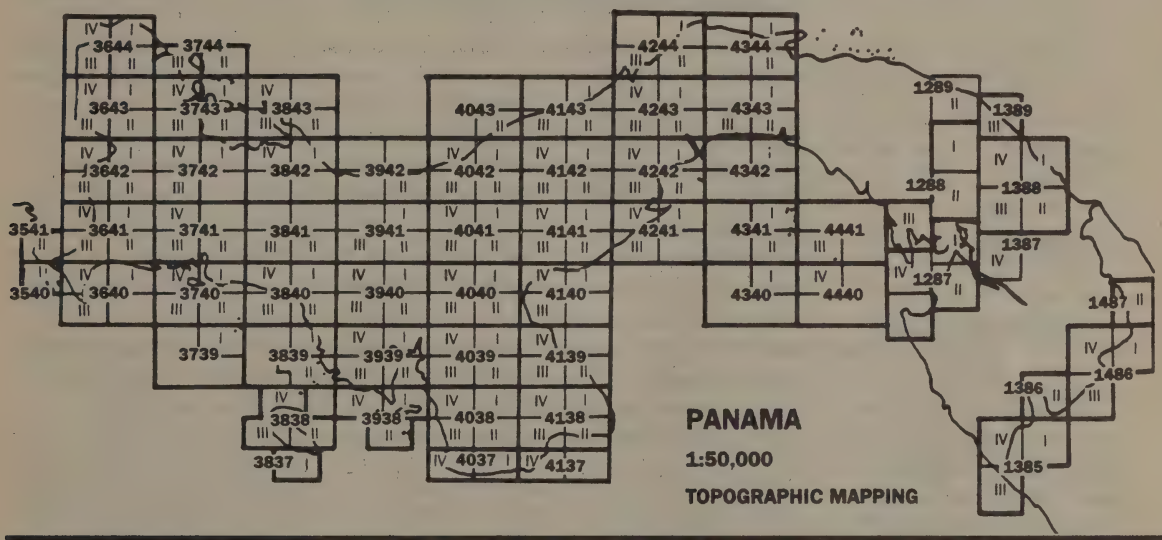
LARGE WALL MAPS

Our largest world map, published by the French government (IGN), combines political colors with subtle shaded relief. It has a great deal of information - literally thousands of cities are located on the map (79" x 160").

World map, 12 sheets	IGN WORLD 12	$149.95	10M	1966

The Defense Mapping Agency (DMA) maps are enlargements of the single-sheet map listed above under the section on Physical World Maps. These DMA maps, popularized as the backdrop for nearly all State and Defense Department news releases, are attractive physcial relief maps showing ocean depth but lacking the cultural detail present on the IGN, Edward Stanford, and Kummerly-Frey maps.

World, physical, 3-sheet, 57" x 74"	DMA WORLD 3	$22.00	na	nd
World, physical, 6-sheet, 86" x 118"	DMA WORLD 6	$54.00	na	1982



Travel Safety: Don't Be A Target

This pocket guide to travel safety is mostly just good sense, but it's always nice to have a well-organized reminder. Some of the advice seems a trifle paranoid, but remember that the information is intended for the unseasoned conventional traveler who may not recognize soon enough that things are not the same in Paris as they are in Dar es Salaam.

I found the tips to be pretty close to what I'd recommend after 35 years of experience. *—J. Baldwin*

•

Use covered name tags to foil the "casual" observer and, if a business person, use your business address but not your business name (don't advertise your executive status or the address of your empty home). Never use your business card for a name tag as it tells too much about you.

Putting a sticker with your name, address and phone number on the inside of your luggage, along with your itinerary will help to re-unite your luggage with you. It will also prove ownership if someone else claims your bags.

Make sure the name on your bags matches the name on your ticket to expedite retrieval if they are lost.

Remove old destination tags and stickers so your bags aren't sent to the wrong destination.

Don't plaster your bags with stickers from fancy hotels.

If checking bags, each bag should be locked and strapped or taped (with duck tape or strapping tape). This discourages pilfering and prevents the bags from popping open. Convenient luggage straps are carried by some travel stores.

Even carry-on bags can be carried off by someone else.

•

To foil muggers, carry a second wallet: a "dummy" with expired plastic & little cash which you can surrender with a smile!

Travel Safety
Raymond Worring, et al.
1987; 73 pp.

$6.95 ($7.95 postpaid) from Uniquest Publications, 6015 Highway 12 West, Helena, MT 59601; 406/443-3911 (or Whole Earth Access).

TRAVELS IN VIRTUAL REALITY

SINCE SPRING OF '89 I've made the rounds of the cyberspace circuit, from AutoCad's "Weird Science" rollout in Anaheim on "VR Day" in June, to the near-riot at Pacific Bell's Texpo in San Francisco the next day, when Jaron Lanier showed off his "Reality Built for Two" in a secret demonstration room. I've visited most of the key research sites, from Mountain View, California, to Chapel Hill, North Carolina, to Seattle, Washington, and back to Sausalito.

Between road trips, I reported some of my preliminary observations on the WELL. Here are some reports from the outposts of cyberspace, adapted from my WELL postings, with no real attempt to hang them together into a framework.

BY

HOWARD

RHEINGOLD

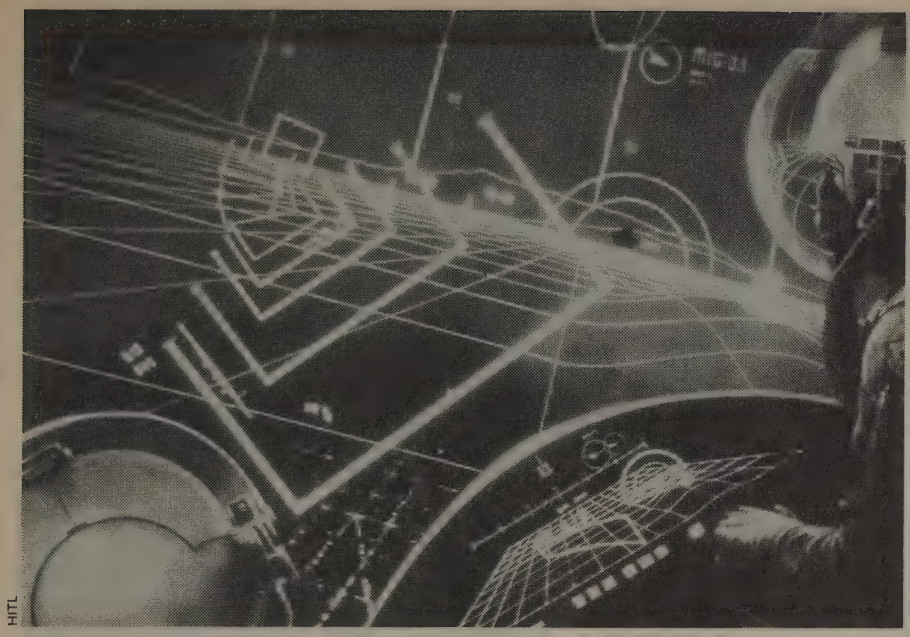
It's an old dream: put on a helmet and step into another world. A useful bit of magic if you can do it. Cognition-tracker Howard Rheingold here recounts his pilgrimage to those wizards presently able to perform this trick. We are following this sorcery pretty closely (see previous articles in WER *#63, p. 84, and #64, p. 108) because it has deep roots which penetrate our minds' view of the world. The head-changing potential of instantaneous realities is so great that Whole Earth will be hosting a 24-hour conference on "The Culture of Virtual Reality, Virtual Reality and Culture" sometime this fall in the Bay Area. If you'd like to participate, write us for details. —Kevin Kelly*

DOCKING MOLECULES IN CHAPEL HILL

The primary research instrument of the sciences of complexity is the computer. It is altering the architectonic of the sciences and the picture we have of material reality. Ever since the rise of modern science three centuries ago, the instruments of investigation such as telescopes and microscopes were analytic and promoted the reductionalist view of science. Physics, because it dealt with the smallest and most reduced entities, was the most fundamental science. From the laws of physics one could deduce the laws of chemistry, then of life, and so on up the ladder. This view of nature is not wrong; but it has been powerfully shaped by available instruments and technology. The computer, with its ability to manage enormous amounts of data and to simulate reality, provides a new window on that view of nature. We may begin to see reality differently simply because the computer produces knowledge differently from the traditional analytic instruments. It provides a different angle on reality. —Heinz Pagels, *The Dreams of Reason*

The University of North Carolina at Chapel Hill is the home of one of the most important and longest-running VR research projects. Driving in from the airport, I noticed that the motto on North Carolina license plates — "First In Flight" — is appropriate to what I think of as the "Kitty Hawk" state of the technology. The work at UNC with chemists and virtual model-builders has been going on for twenty years, and is yielding practical results. The molecular-docking demonstration was a conversion experience for me, at a point where I had grown skeptical about VR conversion experiences.

I've been excited by the VR demos I've seen for the last year, of course, but I can see now that my initial excitement was amplified by my internal extrapolation factor: I had already watched one computer revolution emerge in Silicon Valley. I remember reading, in 1974, about a company that would send a microprocessor-based computer for personal use in a kind of build-it-yourself kit: the now-legendary Altair from long-defunct MITS. The data input on the Altair was accomplished by toggle switches, and the output device was a small panel of indicator lights. The idea of having my own computer seemed like a neat idea, but I was nowhere near the kind of enthusiasm that would have forced me to shell out a couple hundred dollars for a kit. A couple guys ten years younger than myself saw what something like the Altair could become someday, and founded Apple Computer. I thought about the Altair when I looked at that first, crude, monochrome wireframe world at NASA/Ames. I knew I was looking at an Altair, and ex-



HITL

Artist's rendition of an airplane cockpit employing virtual-reality technology. This "supercockpit" merges a "real" scene with a virtual scene to guide pilots landing. In this set-up, designed at Wright Air Force Base in conjunction with HITL, the virtual scenes are projected on the pilots' visors. The large grid in this illustration depicts the virtual image on the pilot's visor. It is superimposed over the "real" scene from the window, shown in the lower left. The lower center grid is a "God's eye" overview of the whole area.

trapolated that by the time VR technology evolves to a Mac II level, these grainy, time-delayed, cartoony "worlds" and the sense of presence they evoke might truly become a level of reality. The sense of presence, not the inherent sexiness of the virtual world, is the source of the conversion experience. And that sense of actually being in another place — cyberspace — can be enhanced by the proper use of sound, kinesthetic, and tactile feedback.

Conversion experiences in computer science, particularly in the realm of computer interfaces, have driven the evolution of personal computers. A man by the name of J.C.R. Licklider had a conversion experience with the PDP-1 in the early 1960s. The PDP-1 was the first interactive microcomputer. You could use a light pen and interact with it directly. It was a puny computer in today's terms, so there wasn't a great deal that could be done with it. But Licklider saw its potential and when he went to work for ARPA, funding futuristic computer research, he ended up funding the development of the interactive computing systems he had envisioned in a flash the first time he sat down with a light pen and touched the screen of a PDP-1. Another maverick computer scientist, originally supported by ARPA, later at SRI, and now at Stanford, was also motivated by a conversion experience. One day in 1950 Doug Engelbart realized that the problems of the world were becoming too complex for people to solve without technological assistance, and that future computers might be used to amplify the power of human intellect, as well as perform their first takes of numerical calculation and data processing. Engelbart's vision of computers that could augment human intellect was a conceptual breakthrough triggered by a thought experiment rather than a real experience with a computer, but it was based on his experiences during the war, when he spent hours staring at radar display screens.

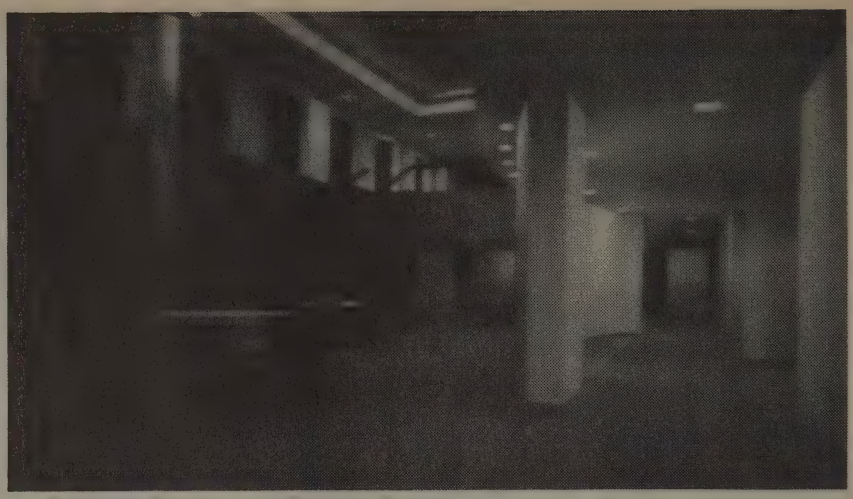
John Walker is another person with the vision to see the development of virtual reality as a realistic technology to base an industrial effort on. A legendary programmer and, as it turned out, a shrewd entrepreneur, Walker was one of the founders and the president of AutoDesk, a company that has sold hundreds of millions of dollars' worth of programs for doing computer-aided design (CAD) on personal computers. In 1988, riding the enormous success of his company, he boldly proposed that AutoDesk ought to get in the cyberspace business. Walker's paper, published internally as "Through the Looking Glass," was the story of one person's conversion experience — a person who happened to have a successful software company to speed development of his vision.

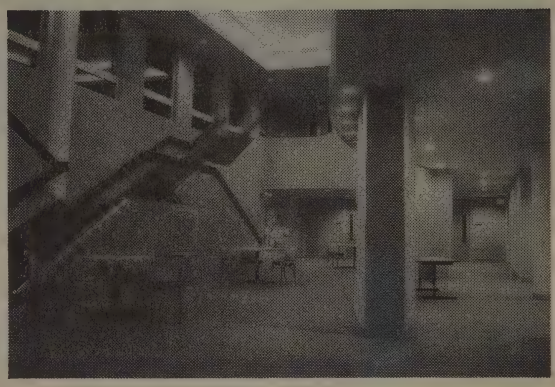
Whenever I stop and think about it, I tend to agree with the VR visionaries who see this as the biggest thing in cultural transformation since the printing press. Every time I try it out for myself, however, I find myself wishing for more visual details, less time-lag when I move my head, more tactile presence. But the molecular-docking demonstration I was given at the University of North Carolina was the convincer for me. It felt like an "intuition amplifier" — a means of augmenting intellectual capabilities for dealing with complexity. And it isn't a technology that might be possible in 1995. It's here today.

The head-mount is one of several different displays for the docking setup. There is a wall-size screen and a special display monitor that is viewed through more conventional 3-D eyeglasses using electronically polarized lenses and LCD screens. I used the eyeglasses, which quite effectively displayed the

(Right) A computer-generated sketch of a to-be-built lobby in a computer-science building. By wearing Virtual Reality goggles, the building's users and architects could go inside beforehand and walk through it. When they did, they found parts they wanted redesigned, and did so by altering the virtual reality.

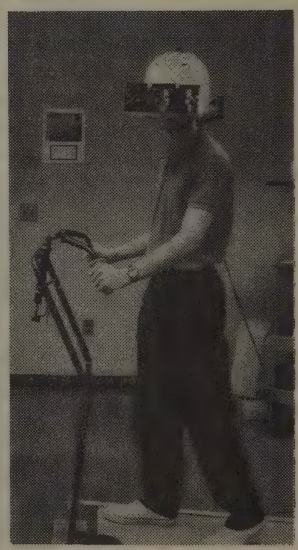
(Below) The real building as it was finally built.





Bo Strain

The apparatus needed to visit the virtual building. A head-worn display (the magic helmet) provides the appropriate view no matter where one looks. The treadmill reckons walking strides and moves one through the corridors.



Bo Strain

colored clouds of pretzeled molecules depicting protein receptor sites engulfing the maddeningly complex drug molecule, which was represented as a tinkertoy-like complex made of solid balls or as a skeletal structure of lines. The problem here is one of geometrical complexity: there are far too many possible spatial configurations of drug molecules and protein molecules for a chemist to find the optimum binding position by conventional means.

The big convincer of the docking demo is the arm, a device that represents the force-fields that bind molecules together or cause them to repel one another in terms of mechanical forces that you sense by gripping a pistol-grip on the end of an electro-mechanical arm. The arm descends from the ceiling in classic "sword of Damocles" style. I put on the glasses, put my foot on a deadman switch, and held the grip. The trigger grip activates the force feedback. Releasing the grip is like lifting the mouse from the table. The molecular model of an actual anti-cancer drug molecule (methotrexate) was already positioned inside the model of the protein receptor site (dihydrofolate reductase). My job was to find an exact fit in which the two compounds could tightly bind. The arm has six degrees of freedom, and exerts enough force to tire your arm if you actively wrestle with a molecule for many minutes. I tried to twist, rotate, jam, tweak, and frob the thing into place by looking at the 3D jigsaw puzzle on the screen and manipulating it with my hand. It didn't take any time at all to develop a sense that I was actually feeling a molecule "out there" in the space defined by the screen.

Even though I know very little about the chemical architecture symbolized by the various colored clouds and tinkertoy bonds, I could feel my way into a place where the arm resisted at a minimum amount between its degrees of freedom. It's like there is a little pocket of relaxation in the middle of the force-puzzle-cloud, and if you can feel your way into it, your arm has to work a whole lot less.

When I wrestled the molecule into a relatively satisfactory zone, bright yellow vectors shot out from the corners of the drug skeleton. Ming Ouh-young, the senior graduate student in charge of the project, pointed out a series of metal knobs on the arm. I was gripping the molecule in place with my right arm. With my left hand, I could frob the drug molecule until the yellow lines disappeared (thus deforming the potential bonds as far as quantum mechanics permits). I imagine that would have been meaningful if I knew anything about chemistry. In fact, it was hard to imagine how a chemist could ever devise a molecule to fit that kind of configura-

tion without 3-D modeling tools; it's a good example of the class of problems where human thinking capabilities come up against a complexity barrier. It turned out that there were five little knobs to frob. The next one minimized the energy levels at certain sites, as displayed by a simple bar graph that popped up in a window in a corner of the visual space.

I didn't know anything about chemistry, and I had been able to use all my experience in the world of gravity and manipulable objects, my gut-feel of the world, to advance a hard problem further than most chemists could have done without any computer modeling. There are fields in which further scientific progress is simply not possible without allowing scientists to stick their heads and hands into 3-D simulations. NASA specialists are using virtual reality to investigate the complexities of airflow patterns over airfoil surfaces. The human immune system, with its billions of reactions per second, and its intricately shape-coded antigens, is another system that must be modeled in three dimensions in order to be understood. The flows of atmospheric gases, and other vital planetary systems, are good candidates for 3-D visualization. Perhaps another scientific/technological field that cannot be studied in any other way is the telecommunications web that has grown around the planet into what Xerox PARC researcher Bernardo Huberman calls "a computational membrane."

Tektronix Corporation, which started out as an oscilloscope company, is already marketing a hardware/software package called CAChe (computer-aided chemical modeling). CAChe is a molecular-modeling program with 3-D input control, stereo 3-D output, and high computing speed. Tektronix's stereo frame-buffer board fits in a Mac II and drives a liquid-crystal, stereo frame shutter that covers the monitor's screen. The unit, transparent to the naked eye, reverses the polarity of the emerging screen's image at 120 hertz, which provides each eye with a left or right view at 60 hertz per eye. The view through "electronic shutters" create a stereoscopic 3D effect by showing alternate views to each eye.

"Architectural walk-throughs" in cyberspace have already influenced the construction of at least one historically appropriate building — Sitterson Hall, home of the virtual-worlds research laboratory of the University of North Carolina at Chapel Hill. Before construction began, UNC VR specialists converted the floor plans into a cyberspace that could be "walked through" with a head-mounted display and treadmill. Those who were going to use the building discovered that two walls in the lobby were uncomfortably close together, creating a cramped feeling. The architect disagreed, until he took a walk through the simulated building and was convinced to move the wall when construction began.

MARGARET MINSKY'S VIRTUAL SANDPAPER

THE FIELD of tactile and kinesthetic force-feedback is perhaps the most leading-edge front of the VR revolution, since so much more is known about visual and auditory perception than about tactile perception. Margaret Minsky's thesis is a Media Lab-UNC collaboration. The demonstration of "virtual sandpaper" had been developed in Chapel Hill, but the actual intelligent joystick I experienced was in her lab, the Snakepit, down in the bottom of the Media Lab building in Cambridge at MIT. (It says "Snakepit" on the door, and there were stuffed snakes woven into the ethernet cables overhead, I noticed.)

The force-feedback arm at UNC descended from the ceiling, rather awesomely. Margaret's joystick looked like a chopstick on top of a steel ice-cream maker. The mechanisms for two degrees of freedom were inside the steel box. I grabbed the cylindrical control rod like a pencil and used it to move the cursor across the screen of Margaret's Mac II. She used various menus to create small patches on the screen, filled with different designs — thick or thin alternating bars, shaded to designate rounded or rough edges; fractal surfaces that looked like unpolished granite. Margaret's ultimate goals involve the full human sense of texture and other related tactile senses. What are the perceptual characteristics that distinguish fur from sandpaper, and how can they be simulated? Margaret's specific project involved building a virtual texture simulator that would allow her to attempt to replicate the research of a psychophysiologist studying human tactile perception with traditional psychophysical methods.

I moved the steel chopstick like a pen, and when the cursor moved across the graphic patch of rounded bars, I could feel, through the variations in feedback force (which were translating the slope of the virtual curve traversed by the tip of the joystick into counterforces that resisted my movements in the right direction at the precise amount of force), the bumpiness of the virtual surface. I felt something bumpy "out there" with my hands, the way you feel a fence "out there" by running a stick along it. Then I ran the cursor over a fractal surface and it felt like I was trying to write with a ballpoint pen on the surface of a piece of granite. Again, there was a palpable chunk of virtual granite in my whatever-you-call-the-gut-equivalent-of-"mind's eye." "Where is 'out-there'?" is a very good question. Was I feeling it in my fingers? At the end of the joystick? On the surface of the screen that depicted the cursor and the virtual texture? Depending on how I thought about it, I could move my sense of presence from one to another of those locations. Given visual and auditory cues, I could see that this sense of physical presence could be made much more plastic than we are accustomed to feeling when dealing with solid objects in the external world. ►

She even had a virtual-texture version of the SIGGRAPH teapot. (For historical reasons having to do with the whims of a University of Utah computer scientist who came up with some of the earliest renderings of solid surfaces, the Association for Computing Machinery's annual Special Interest Group — Graphics conference has always included increasingly realistic renderings of teapots, year after year. This year, Nicholas Negroponte harangued the computer graphics subculture about their obsession with ever-more-realistic teapots and demanded that they direct their attention back to the use of graphics in the computer interface. Virtual teapots, I realized, span both areas of concern.)

While Margaret and I talked, I kept running the surface of the cursor over the contours of the teapot. A strange sensation. I could see how adding this to the kind of kinesthetic feedback offered by the UNC arm, and the eyephones, and the datasuit, and 3D audio could begin to approximate vanilla reality to a disturbing degree. The molecular-docking project had audio feedback to signify molecular "bump forces," and NASA demos show how auditory cues could be very helpful in trying to fit two pieces of machinery together in space, via teleoperators. Imagine trying to put a key in an unfamiliar lock in the dark. Imagine if the key and the lock beeped in the right way. You could couple your muscle movements to your acoustic apparatus for sensing space. The elasticity of the human capacities for feeling spaces that do or do not exist is another big open question.

HOMEBREW VR

I JUST CAME BACK from a nifty little ride in one of the first, if not the actual first-ever homebrew cyberspace. It was assembled from absolute scratch in one month flat. A little more than 30 days ago, Eric Gullichsen and Pat Gelband left Autodesk, where they had been working on the cyberspace project, to start their own company, Sense8. The system they put together is crude, experientially speaking — about as crude as the Altair, the first microcomputer kit of the mid-1970s.

Since Eric and Pat live and work within a five-minute drive of my house, I've had occasion to observe their progress firsthand. They got a Polhemus position-sensing system (easily the most expensive part of the apparatus) and built their own head-mounted display from more or less the same off-the-shelf parts that were used at NASA. The computer is a modified Amiga. Until they get a glove, they are using a 6-degree-of-freedom orb that has two buttons on it. Very nice. In some ways, the orb is a better control device than the glove. The glove is very helpful in establishing your sense of presence and orientation in a virtual world, but the technology right now is nowhere near as finely tuned as the orb; it is far easier to zoom around a molecule or a floorplan with the orb than it is, at present, with a glove. They put together a computing and rendering engine for about $2,000. Then they wrote the code.

I remember dropping by a couple times while they were working it out. Pat would be doing mathematics with pencil and yellow pad in the kitchen; Eric would be hacking code in the living room. Having built a cyberspace software system once before was a big help, but they wanted to do their own system a different way, for hackeresque as well as legal reasons. They finally got it working in mid-February. The first world they had working was just a green plane — thirty polygons or so — with three pyramids. You could use the orb or the buttons and your line of sight to fly around.

Of course, VPL's multi-hundred-thousand-dollar version is slick, and far from slick enough yet. But the homebrew version, which costs about one percent of what VPL's system does, is certainly more than a hundred-thousandth as exciting as the high-end worlds. The important point is that it is an existence proof of homebrew VR. Just as enthusiasts like Jobs and Woz and the rest of the homebrew computing club forced the PC to evolve from the Altair to the Apple, VR enthusiasts can add their efforts to the more well-funded projects in universities and industrial labs. It is now possible for people to build systems and exchange worlds, to propagate improvements, to evolve the way personal computers did. It remains to be seen whether there will be very many cyberspace homebrewers, or whether they come up with a rich set of tools, or whether they find ways to share their efforts. But Sense8's system proves you don't have to be NASA. You don't even have to be Autodesk. You can do it in your living room, the way Eric and Pat did.

Tomorrow morning, they pack up the system in black ammo boxes and head for a cyberspace conference in Barcelona, with William Gibson and Tim Leary. I wish I could say I was covering the story. I'm packing my raincoat and heading for Seattle.

HITL, THE PORT OF SEATTLE, AND VR AS A COMMUNICATION-AUGMENTING TOOL

I JUST RETURNED from Seattle and Vancouver. Tom Furness, who was director of the Air Force Wright-Patterson AFG "Super Cockpit" project for 23 years, has started the "Human Interface Technology Laboratory" (HITL) at the University of Washington. Except for Ivan Sutherland, who pretty much quit the field after creating the "Sword of Damocles" head-mounted display (which got its name from the fact that the headset was connected to a heavy electromechanical posi-

tion-tracking device mounted in the ceiling), Furness has been in this research the longest. Very neat guy. He wants to build a laboratory to create the hardware, the software, and the mindware — the task-specific applications that will enable people to use VR technology to augment their physical and mental capabilities. He's very much in the tradition of Doug Engelbart (intellectual augmentation) and Fred Brooks (intellectual amplification).

One of the more interesting interviews I conducted up there was with Cecil Patterson, the information systems director for the Port of Seattle, who is eager to work with HITL to set up a VR system. He has some interesting reasons for pursuing this technology. First, he recognizes that there is a need for better communication between engineers, facilities planners, and potential clients, when it comes to discussing the actual physical configuration of future port facilities. He sees VR as a kind of "what-if" machine for computer-aided design (CAD). The problem with most CAD is that designers understand what renderings of designs on a computer screen mean far better than their clients. The best way to find out how you feel about a three-dimensional design is to walk around in it and handle it.

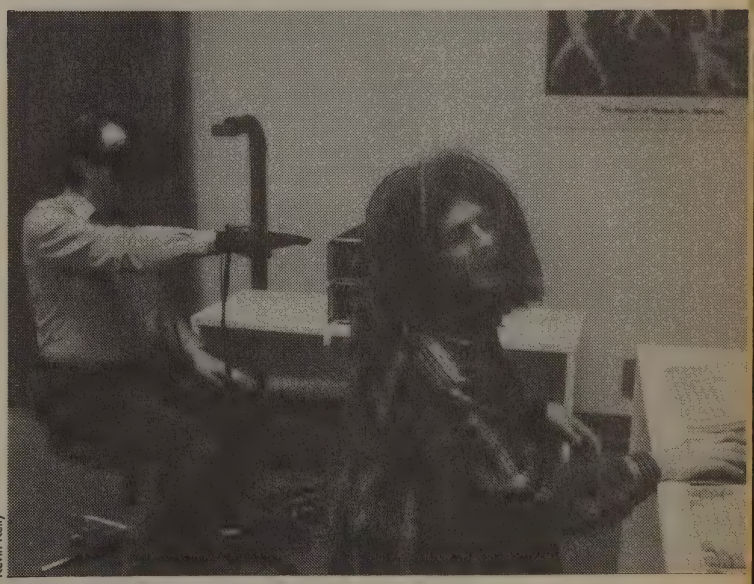
The second and, to my mind, most interesting reason Patterson wants VR is that most of these clients who are in on the planning stages of multi-hundred-million-dollar plans are Japanese, Chinese, and others for whom English is not a native language. He hopes that misunderstandings, delays, and bugs that are caused by the language problem might be mitigated if the engineers, planners, and clients on both sides of the Pacific could walk through VR versions of the proposed construction during every stage of the planning process. That way, even though the spoken language barrier may remain, the pictorial mental models of what they are planning will be much more in accord. When different people talk about a three-dimensional object, there is some question about how similar their mental models are. When they talk about it and walk around a 3-D model, their mental models are likely to be much more highly synchronized.

Jaron Lanier has his dream of VR being the matrix from which a visual language will emerge, which is a very interesting idea — but I'm not sure how, when, or if it can be accomplished. But VR as a communication-augmentation device seems to me immediately practical. I think this is a very savvy use of the technology. The port directors know that miscommunication in the planning of such expensive facilities will affect the region's economic well-being for decades to come. Spending a few tens of thousands on hardware and software for visualizing and communicating is a very economical first step in a billion-dollar plan.

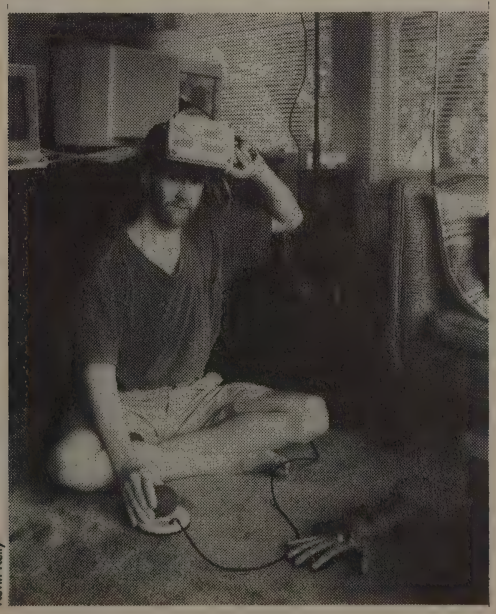
BUILDING WORLDS WITH JARON

IN RESPONSE to my frequent pleas, Jaron gave me a world-building tutorial last night. My objective is to master the basic steps well enough to build a world of my own, then step into it and fly around.

I had an idea in mind. Since we had been conversing



Kevin Kelly



Kevin Kelly

(Above) Jaron Lanier tweaks a virtual world for Howard Rheingold (behind mask) by calibrating his extended dataglove, the sensory mitten that transposes the movements of Howard's hand into the identical movements of his virtual hand.

(Left) Eric Gullichsen demos his home-brewed version of cyberspace. The do-it-yourself computer is a small black box behind him. The goggles ride on a plastic golf visor, the hand-orb substitutes for an expensive dataglove, and a minimal location sensor sits on the pole near the window. A $90 Power Glove by toymaker Mattel sits on the floor waiting to be hacked into the system.

about ecstasy and VR and my theory that a cleverly designed world might help create a healthy sort of ecstasy, I thought I'd like to build a full-scale kiva — a ritual space used by the Pueblo tribes of the southwest. There would be a subterranean chamber, and a ladder out of it. At the top of the ladder is the surface of the planet. If you flew off the planet, you would see oceans, continents, and clouds. There would be a moon, orbiting the planet. And stars. A basic cosmos. It is, in fact, the first actual planet that anybody has built at VPL. Maybe the first virtual planet anybody ever built anywhere.

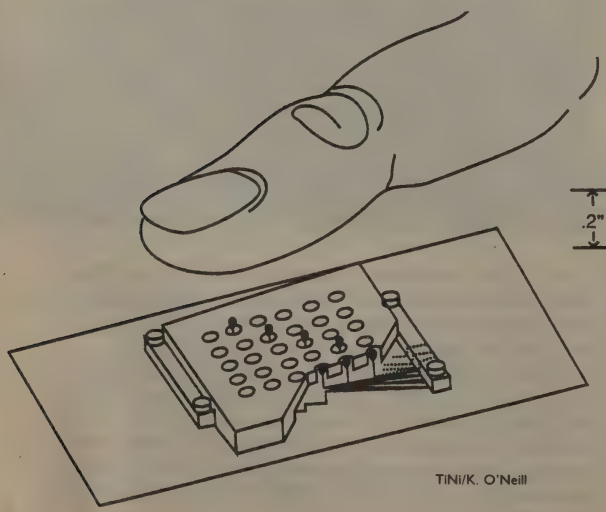
The worldbuilding process starts with Swivel-3D, a slightly Macdraw-like (but more complicated) tool for creating 3-D models on the Macintosh. Later, after the basic structures are created, another program is used to add dynamics; ultimately, the software describing the set of objects that constitutes a world is moved from the Macintosh format to a Unix-readable form. Then VPL's language, "Body Electric," is used to map the world to the input devices. Worlds created this way can be linked and embedded within one another. Who knows what future planet-builders might add to our basic design?

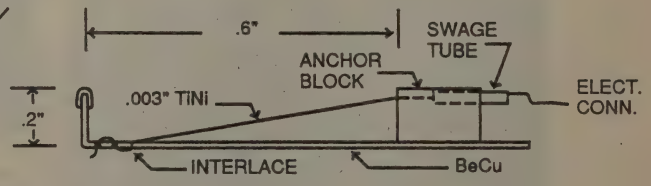
Jaron handled the commands this time while I helped him zero in on what I had in mind. The first image of the world was a wireframe sphere, which we colored blue in solid mode. It is faster to shape the basic structures in wireframe, then issue a menu command to render them as solids. Then lighting and shadow effects can be tweaked. What you see are four windows, three showing views of the object being edited, from the x, y, and z axes, and one window showing the object as it would appear in perspective. Next, we created a duplicate sphere, just slightly larger than the blue one, and colored one or two regions of the second sphere brown. Then we centered the second sphere around the same center as the first one and linked them together. Since the second sphere was just a bit larger, the brown "continents" stood out from the blue "oceans." The next sphere, colored white, had tinier regions as 'clouds," and it stuck out quite a bit more on the z-axis. We only used about 80 polygons out of a maximum 2,000 possible for each frame, so it isn't the most realistic world when you see it close up. Not yet. Zooming away into space, it looks pretty good, though. Recognizable as a planet. Then we created a smaller, gray sphere, linked and constrained it so it appears to be orbiting the planet. And stars. That's as far as we got on that pass. More later.

TACTILE FEEDBACK — FROM BRAILLE TO DILDONICS

DAVE JOHNSON of the TiNi Company invited me to come by his laboratory-office-factory to see the work they are doing with a tactile-feedback prototype. It was in a postmodern corrugated-steel light-industrial building in Emeryville, a formerly decaying heavy-industrial area south of Berkeley that now seems to be reemerging as a center of late-twentieth-century microtechnologies — there are software companies and futurists, genetic-engineering plants and digital mapping outfits within a few blocks of TiNi. The TiNi plant was reminiscent of what Edison's Menlo Park facility must have been like — everything under one roof.

Johnson had been working under contract for the Air Force. The "Super Cockpit" project at Wright-Patterson Air Force Base had included plans for a glove that included miniature force-feedback sensors so pilots could get the fingertip feel of virtual switches; that is, the pilot wears a head-mounted display and sees a virtual depiction of the landscape (with bright red "zones of lethality" surrounding anti-aircraft missile batteries, and overlaid grids marking optimal flight paths to targets, and eye-tracking target-detection, etc) and a depiction of a virtual control panel. He reaches out his hand to





A prototype mechanism for tactile feedback in virtual reality. The device consists of 30 flexible, cantilevered beams, each of which may be lifted by the electrically induced contraction of a shape-memory alloy. Signals picked up by a moving hand in virtual reality trigger a simulated pattern on the tactile array. A real finger placed in contact with the touch pad feels a pattern of protruding nubs, activating an illusion of feeling a texture or object.

one of the virtual switches, and when he actuates it, he not only sees the computer-graphic representation of the switch move, and hears it "click" if need be, but he also feels it toggle.

This glove doesn't exist yet. And neither does a multi-line braille computer terminal. But the TiNi folks think their technology will lead to such items. (And I think that you don't have far to go to build a tactile-sensitive bodysuit, once you can build a tactile sensor-actuator glove.)

TiNi uses "shape memory" alloys such as nitinol as the basis for a little grid of what look like little ballpoint-pen tips. The alloy assumes one shape when it is cast, then when it is cooled, it can be formed into other shapes; when heated again, it returns to the original shape. It can be used to perform the kind of mechanical switching that solenoids do, on a smaller scale. By entering the proper command to the computer interface, the 6- by 5-pin array, about 3/4" square, starts moving. I touched my finger to the grid, and felt something like a pencil lead underneath a piece of cloth moving across my fingertip as the rows of pins were activated in the proper sequence; I could feel the individual pins, but I could also perceive their synchronous movement as being akin to a pencil lead underneath a piece of cloth — there was a tactile whisper of possibility. The speed and pattern of activation can be controlled by software.

Not a heck of a lot is known about tactile perception, certainly not in comparison to the scientific knowledge about visual and auditory perception. But those pins FELT GOOD! Kinda tickly and soothing. My friend Flash Gordon has a chair that does something with your vertebrae that can seem obscenely pleasant. It's a bit like that. The possibility of virtual dildonics, however, is a topic of its own. I see at least ten years, probably more like twenty, of extensive research to get to a truly lifelike televirtual tactile experience. At a recent scientific conference in Santa Barbara, I met the head of the machine perception group at AT&T Bell labs, whose research goal is to find a way for AT&T customers to actually "reach out and touch someone" (although perhaps not as intimately as would-be dildonists fantasize).

VIRTUAL WORLDS AND THE VIRTUAL COMMUNITY

WHEN I STARTED traveling from one research site to another, and started collecting information about virtual-worlds research, it became clear to me that the many different related subdisciplines necessary for building virtual worlds are proliferating information very rapidly — too fast for anybody to keep up. As a firm believer in the power of electronically mediated virtual communities, I proposed to Tom Furness that HITL sponsor a newsgroup on Usenet (*WER* #65, p. 112). This would have several benefits. First, it would serve as an informal channel for exchanging information in the VR research community, and a place to discuss issues. Second, it would make people in the field aware of each other's efforts. Third, it would make it easier to gather information for my book. I was already a participant-observer. I might as well just jump right into the field I'm trying to chronicle. I agreed to become the moderator of the new newsgroup, which is called sci.virtual-worlds. If you have access to Usenet, you should be able to gain access. The following is excerpted from the statement that first proposed the new newsgroup, drafted by Bob Jacobson at HITL:

> *The Human Interface Technology Laboratory at the University of Washington proposes to host this newsgroup for the study of "virtual-world" phenomena. We believe that the coming proliferation of virtual-world phenomena, made possible by powerful virtual-interface technology, requires the scientific community served by Usenet to begin debating how this technology will be employed. Further, with additional research on virtual-world phenomena taking place at more and more research sites, and in a growing number of fields — aerospace, medicine, entertainment, education, and science — it is imperative that there be a forum where the outcomes of this research can be shared most widely.*
>
> *A "virtual world" is a unique, intangible but highly designed information environment generated by a computer and transmitted by "virtual-interface" technology to a user who "enters" the virtual world via appropriate sensory mechanisms. The virtual-world environment can be as complex as a three-dimensional "sense surround" comprising seamless visual, aural, and tactile cues; or as simple as a computer conferencing system. Virtual worlds are designed to increase the bandwidth of communication between the computer and the human being, to facilitate their interaction, and ultimately to improve the human being's understanding and performance. The subject of this newsgroup will be virtual worlds in all their aspects: the theory of virtuality, the technology that is being developed and employed to create virtual-world environments, the people and places working on virtual worlds, and the philosophical questions and social consequences attendant upon the emergence of this new medium of communication. The Laboratory intends to make available via Usenet a database referencing the items in its considerable library regarding virtual-worlds phenomena and research. The database is in preparation. An announcement will be made when this archive is publicly available.* ■

Mandolin Bros. President, Stanley Jay, plays a 1930s National "Steel" Duolian guitar with engraved Hawaiian scenes on front and back. The popularity of Dire Straits' album *Brothers In Arms* has made pre-war Nationals exceedingly popular. Mandolin Bros. sells this model for $950 typically. In the background are orchestra guitars which include 1951 and 1937 Gibson Super 400s.

Mandolin Brothers

If there weren't already a hornpipe composed to celebrate Staten Island, someone would undoubtedly create one, for it has become Mecca for stringed-instrument aficionados from all over the world. Mandolin Brothers Ltd. offer the finest products from the most prestigious makers of guitars (including Dobros and pedal steels), basses, banjos, and mandolins — from Gibson, Martin, Kentucky, and Washburn to custom Monteleone mandolins. Their illustrated, 60+-page catalog will make any musician drool — original handmade Orville Gibson F-model mandolins, a signed Lloyd-Loar 1924 mando-cello, "No. 9" Tubaphone banjos, even an 1834 C. Frederick Martin guitar, from the days when the virtuoso guitar maker had his shop on Hudson Street in New York City. Along with instruments, they sell accessories (strings, bridges, tuning pegs, etc.), pickups, effects gear, and a wonderful assortment of instruction books. Mandolin Bros. prices on new instruments are discounted below what most music stores offer, and they ship promptly and safely via UPS.

Mandolin Brothers Ltd.
Catalog **free** from Mandolin Brothers Ltd., 629 Forest Avenue, Staten Island, NY 10310; 718/981-3226.

Mandolin Bros. owner Stan Jay is delightfully frantic — in response to a telephone inquiry about a used mandolin I was considering buying from a classified ad, I got a 20-minute seminar on factory-made vs. handmade mandolins, and a two-page letter afterwards with suggestions on what I should look for.

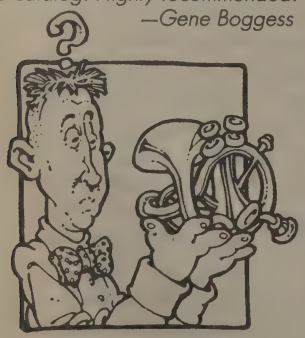
—Kevin T. Dann

[Suggested by Thomas Hodgson]

Wichita Band Instruments

I know Whole Earth people are more interested in sources of folk or esoteric instruments such as harmonicas, bagpipes, and Celtic harps, but if you need a regular band instrument, this is the place to get it. What's right about these folks? Well, they are friendly on the phone, they tell you what they have in stock, they have a lot of stuff in stock (including some used instruments), they have great prices, they ship immediately, they offer free exchange privileges, they don't bill you until you have the instrument, and they thank you afterward. They also have a nice catalog. Highly recommended.

—Gene Boggess



The next time you're looking at a musical instrument catalog, and you're wondering whether the company *really* has four-valve bell-sideways alto horns and genuine gold-plated bagpipe mouthpieces in stock, be honest with yourself: you really don't want that stuff anyway. What you really want is good prices, good service, and fast delivery on America's most popular wind instruments. That's what we offer, and that's what we show in our catalog. Period.

Wichita Band Instruments
Brochures **free** from Wichita Band Instrument Co., 2525 E. Douglas, Wichita, KS 67211; 800/835-3006 (in KS: 800/248-0048).

Missing Link

*If, as Stephen Gaskin observed in a recent **WER** (#61, p. 64), there are a million hippies out there with Macintoshes, how many of them also have four-track recorders?*

The private music network has been active for years. A lot of fine work has passed from hand to hand between musicians themselves, and been circulated in publications catering to cassette artists. Typically, though, most cassette distribution services are either labels or are targeted to specific music genres.

Missing Link Music is quick to point out that it is NOT a label. It offers artists a straightforward business arrangement: you produce your tapes, we'll duplicate and/or distribute them and keep you posted quarterly on how they're doing. Artists represented in their catalogue retain full rights to their products.

The MLM catalog is honest ("This music would make an excellent soundtrack to a very bizarre film"), entertaining ("The music drifts, tumbles, soars, attacks, fades, and then looks around for something different to do. Guaranteed to confuse a cat"), eclectic ("Joe's Tapezine is a collection of poems, rants, raves, and other verbal works put together by a group of folks from the Minneapolis area") and free. The annual catalogue is updated regularly, and tapes are accepted year-round.

*Currently popular tapes include **No Bones** by Amy Denio, **Danger Zone** by Statik Action, titles by Applied Science, Oasis, Brian Gingrich, and, of course, the **MLM Sampler**, for a little taste of it all.*

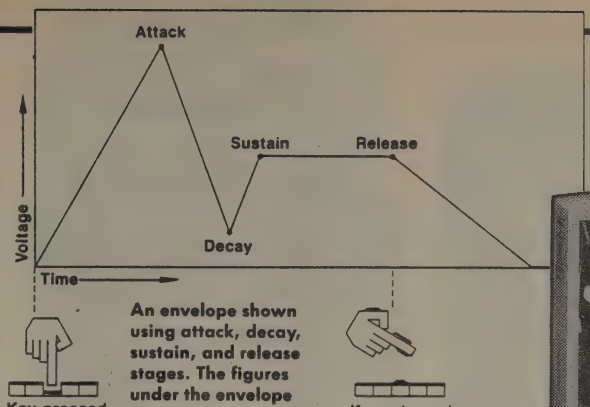
—Gary Davidson

Music Through MIDI

I'm not a musician, nor a programmer, but I like music & have a Mac so I bought this book. Great move. This is the only book on MIDI that doesn't assume you're either a musician or a technical wiz, only that you have a desire to make music. It succeeds not only in explaining MIDI, but also how computers & synthesizers create sounds & music. I now own a (MIDI capable!) Yamaha PSR41 electronic keyboard & am having great fun making music through MIDI. —Steve Mattan

•

Another way to add speakers to your MIDI system might be as close as the next room, where you might have a portable cassette player with its own speaker system (often called a "boom box"). Most of these cassette players have a pair of line level inputs into which you can plug the output cables from your synthesizers or your mixer. You can then play your MIDI system on the speakers of the boom box with the added advantage that you can record your performances on the cassette recorder while you play.



An envelope shown using attack, decay, sustain, and release stages. The figures under the envelope show how the envelope is tied to the beginning and ending of a note played on a keyboard.

Music Through MIDI
Michael Boom, 1987; 302 pp.
$19.95 ($22.45 postpaid) from Microsoft Press, 1113 Heil Quaker Boulevard, La Vergne, TN 37086; 800/888-3303 (or Whole Earth Access).

Soper Sound Music Library

When you are making a multimedia show on a budget, this kind of pre-recorded music is what you use if you don't have an orchestra on hand, and don't have the inclination to whip one up on a synthesizer. Soper Sound sells canned professional orchestral music of many persuasions for use in commercials, video documentaries, training films, etc., when copyright clearance is a necessity. (Copyright is usually expensive and messy.) The innovation here is that rather than having to negotiate for each use, when you buy a tape or CD from these folks you can do most anything you want with the music, using it as many times and places as you care (technically it's a 99-year license). Not Muzak, but mood and setting music crafted for visual accompaniment. The tracks are often constructed so that they can be looped end-to-beginning to form longer segments. Ask for sample cassettes.
—Kevin Kelly

Soper Sound
Catalog **free** from Soper Sound Music Library, P. O. Box 498, Palo Alto, CA 94301; 800/227-9980.

Series I (Production Music) . . . . . **Albums $325 Tapes $345**
2 hours and 19 minutes of music on 5 records. You will discover a broad range of musical styles, instrumentation and selection length in these 73 tracks. Instrumentation includes rhythm section, electronic keyboards, electric guitar and wind instruments.

SERIES I / ALBUM THREE / SIDE A Syntropy Music Publishing/ASCAP

CAT. NO.	TIME	TEMPO	MOOD	STYLE	TITLE	INSTRUMENTATION	GP. SIZE	KEY
13A- 1	3:15	FREE/0	MELLOW	ORCHESTRAL	ST. PETE'S GATE	HRP.PNO.CHI.VLN	MED	F#
13A- 2	1:34	FREE/0	MELLOW	ORCHESTRAL	GHOSTLY VIOLIN	EL.PNO.VLN.CHI	SML	C
13A- 3	1:30	FREE/0	MELLOW	ORCHESTRAL	THE JOURNEY	EL.PNO.CHI	SML	C#
13A- 4	1:30	FREE/0	MELLOW	ORCHESTRAL	DUTCH FLATS	EL.PNO.VLN.CHI	SML	D
13A- 5	1:30	FREE/0	MELLOW	ORCHESTRAL	BADLANDS EVENING	EL.PNO.FLU.CHI.SYN	SML	Eb

Missing Link

Catalog **free** from Missing Link Music, 6920 Roosevelt Way NE #328, Seattle, WA 98115.

•

18 NO BONES *Amy Denio*

This woman is very talented and has a good sense of humor. She plays every instrument (including electric bass, voice, keyboard, paperback book, bass clarinet, and kitchen sink, to name just a few) on this playfully out-there tape. The songs have thin resemblances to jazz, funk, techno-pop, and even folk, which have been contorted into her own truly original creations. "Crisply recorded and full of odd-ball ideas . . . Denio is really in command of a slew of instruments, and certainly knows what she is doing in the studio." (Bret Hart, *Option,* Sept/Oct 1987).

National Holidays/Couch of Sound/Ring Finger/March/I Wear Guns When I'm Dancing/Spastic Entropy Waltz PLUS fourteen more . . .


Amy Denio.

World Music on CDs

BY JONATHAN E.

THE EXPANDING INTEREST IN music from around the world is reflected both by the increasing number of releases and by the broader variety available. What follows is by no means a comprehensive guide, but rather an attempt to provide signposts to some interesting territories. It is limited to CD recordings released in the U.S.

Many of the titles below are rather delicate pieces of music and significantly benefit from being heard on CD rather than vinyl or tape. A simple A-B test shows that the CD version has greater clarity and definition as well as being richer and having more presence. The difference is about the equivalent of looking through a slightly misted window as opposed to no window at all. In most of these particular recordings, however, I find that the major improvements are to do with surface noise and durability. However careful you are with vinyl, it suffers wear and tear. Clicks and pops appear, and with delicate music they are overly detrimental to the listening experience. However, if you don't have a CD player, these are still genuinely fabulous pieces of music that you should treat yourself to on vinyl or tape.

Generally, I also chose these recordings because these sounds transcend their own cultures and have a certain ecstatic quality composed of both gentleness and power, delicacy and strength. All have some traditional roots, but almost all include influences from outside their immediate culture, reflecting the true nomadic tides of human existence and culture. They are mostly small, mostly acoustic ensembles that can be played at relatively low volume without sounding muted or losing resonance. Nobility and beauty are the common denominators to all of them. Hopefully, those who like accordions should be happy with this music. They also nearly all have good sleeve notes, which make clear the philosophy of the lyrics and fill in the artists' backgrounds.

One ecological note of particular relevance to CDs: Among all the arguments raging about CDs, the most significant and least idiosyncratic is that of the outrageous amount of packaging the retailers claim is necessary for display and theft prevention. Funny they don't have those problems with considerably smaller cassettes. Funny the Europeans don't bother with it. One option is to recycle it yourself, but better would be to strip it off in the store and leave it there. The retail music business is sensitive to such consumer behaviour, and in time they'll figure out an alternative. You can bet the manufacturers don't like paying for all that cardboard and printing and folding and gluing and shrinkwrapping, but to increase leverage try mailing the excess packaging back to the head office.

ACCESS

Each of these CDs is available for $19.63 postpaid from Express Music, 50 W. 17th Street, New York, NY 10011; 800/233-6357.

North-West Africa

Baaba Maal & Mansour Seck *Djam Leelii* (Mango CCD 9840). From Senegal. Two acoustic guitars, wailing vocals, and gentle percussion with balafon and subdued electric guitar produce a measured, stately, chiming music that swirls around and around in a endless spiral of seamless sound.

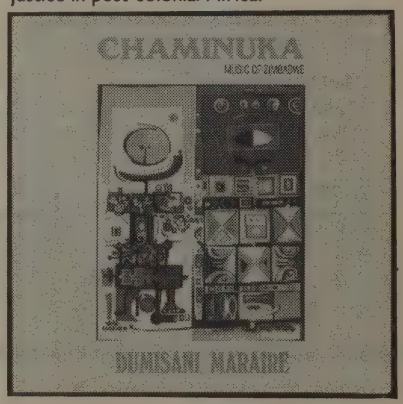
Ali Farka *Toure* (Mango CCD 9826). From Mali. Stinging, ringing, intense solo guitar and hoarse, aching vocals atop bongos recall country blues without that genre's edge of sadness, but vividly recalling and sharing its inherent strength and dignity.

Jali Musa Jawara *Soubindoor* (Mango 9832). From the Ivory Coast and Guinea. Warm-sounding kora and balafon contrast against the soaring but husky call-and-response male and female vocals for a flowing, cascading effect of fragile, see-sawing beauty.

South-East Africa

Remmy Ongala *Songs For The Poor Man* (RealWorld/Virgin 91315-2). From Tanzania and Zaire. A rolling, complex sound from an eight-piece ensemble, complete with kit drums, hand percussion, guitars and saxophone, topped by fluid vocals. Most songs start at a relatively relaxed pace and build to a gallop, with a soukous-style guitar whipping along. Somehow everybody reaches the finish line at the same time.

Thomas Mapfumo *Corruption* (Mango CCD 9848). From Zimbabwe. Thoroughly contemporary expression of traditional Shona music. Guitars recreate the mbira perfectly, the stuttering hi-hat and bass drum capture the original foot stomping and gourd rattling, while the horns blow in contrasting color. Mapfumo's shamanic vocals ache with the sad plight of social justice in post-colonial Africa.



Dumisani Maraire *Chaminuka: Music Of Zimbabwe* (Music Of The World CDC-208). From Zimbabwe. All marimba and mbira (and a few gourds) with dry vocals on a mix of original Maraire pieces and traditional Shona tunes. An interestingly sparse contrast to Thomas Mapfumo, and a recording that continues to grow on me after a slow start.

Philip Tabane and Malombo *Unh!* (Elektra Nonesuch Explorer Series 9 79225-2). From South Africa. Deep thudding drums, twangy guitar, a lonely whistle, solitary sax, twin trumpets, and pattering percussion underpin guttural, wailing voices. Philip Tabane is a unique artist, absolutely unlike anyone else I've heard. His music seems about to break down any moment, but hangs together with uncommon sinewy strength.

Abdullah Ibrahim/Dollar Brand *Midif* (Enja R2 79601). From South Africa. Eerie, breathy, jazzy sounds from the desert dusk alternate with brighter, clearer scenes of daylight busyness. Timeless African mystery absorbs the brash elements of American jazz. This was the soundtrack to *Chocolat*.

Trans-Atlantic African Diaspora

(Various) *Brazil: Forro "Music For Maids And Taxi Drivers"* (Rounder CD 5044). From northeastern Brazil. A jaunty merry-go-round of carnival sound relentlessly bouncing into orbit. Four rockin' and swingin' little combos give prominent pride of place to accordion and percussive mania. Nicely paced, with definite possibilities for wild dancers to get creative.

(Various) *Brazil Samba Roots* (Rounder CD 5045). From Rio de Janeiro, Brazil. The fabled "grace under pressure" quality soars with instant vibrancy and warmth into an eternal swirling samba. The honesty of this recording is a refreshing change from the snippets-live-from-the-street style or the pumped-up pop samba. Given their somewhat similar backgrounds, this style is a fascinating alternative to the sadness of the blues.

(Various) *Konbit! Burning Rhythms Of Haiti* (A&M CD 5281). From Haiti. Generally not as frantic as zouk or soca, nor as languid as reggae, Haitian music has a comfortable groove — but, make no mistake, it swings from joyous horn and percussion work-outs to Pink-Panther-strutting reggae. This is an exceptionally strong compilation covering a lot of stylistic ground, with an emphasis on socially relevant lyrics — the title song is about community reforestation.

(Various) *Sabroso! Havana Hits* (Earthworks/Virgin CDEWV 11). From Cuba. The magic stew of Cuban music has been shut out of the U.S. for so long that any taste of it is tantalising. However, this collection does not rely upon rarity alone. The blasting horns and famous percussion slide beneath the pianos, flutes, and expressive vocals for a moving, sophisticated and intricate effect.

Musical Meetings

Ketama, Toumani Diabate, Danny Thompson *Songhai* (Hannibal HNCD 1323). From Spain, Mali, and England. The perfect combination of shimmering kora and flamenco guitar with a subtle, pulsing bass, aided and abetted by percussive handclaps, choral African vocals and guttural exhortations. The result is dynamic and propulsive, but not pushy. Sheer musical wonder.

Jon Hassell/Farafina *Flash Of The Spirit* (Capitol/Intuition CDP 7 91186 2). From Burkina Faso, Canada, and England. Slithering effect-laden trumpet crawls over percolating percussion, disembodied vocals, and echoing electronics. The music's pan-ethnic origins hide in shifting sands of otherworldliness. It should have been the soundtrack to *Dune*. Definitely not for purists.

Dissidenten *Out Of This World* (Sire/Reprise 9 26030-2). From Germany and Morocco. The cool of European electronics does a funky dance with the warmth of the North African night in an obsessive and tight embrace, hips perfectly attuned, feet swept from the floor. Earthiness and etherealness are so close here, it's hard to tell when one begins or ends. This is an up-to-the-minute pop production, but with deep roots.

Balafon Marimba Ensemble (Shanachie 67002). From Oregon, U.S.A. Nothing but five marimbas, mbira and a forest of percussion. The music originates from several cultures, although Zimbabwe is particularly well represented. But the differences between Maraire's solo marimba or Mapfumo's modern mbira and this massed pounding of the marimba keys ensures no overlap in aural pleasure. The clean energy of Balafon is uplifting and positive. Throwing into consideration their live performances, they seem to me to be one of the most exciting and potentially significant groups to come down the pike in a long time.

Asia

Idjah Hadidjah *Tonggeret* (Elektra Nonesuch Explorer Series 9 79173-2). From Java. Floating, eventually soaring, somewhat guttural female vocals are urged on by call and response with several male vocalists over a careful, colorful flower arrangement of emphatic drums, gongs, metallophones, and a

quiet, quavery fiddle. Some of this music is a popular dance style in Java, but I don't quite see it at the local disco. But there is one track I might try for truly ambitious dancers!

(Various) *Bali* (Elektra Nonesuch Explorer Series 9 79204-2). From Bali. A series of jewel-like water gardens with ringing, metallic pools of sound are strung together by sudden rushing cascades of sparkling notes. Flutes, jew's harps, and pieces of bark also provide a reedy quality, and on one track the famous frogs of Bali have influenced the locals' music more than they have all the environmental recordings put together.

Includes a kecak or "monkey-chant" recording, and, for good measure, the most interesting timing between tracks I've heard yet.

Nusrat Fateh Ali Khan — Qawwal And Party *Shahen-Shah* (RealWorld/Virgin 91300-2). From Pakistan. Ecstatic feverish vocals over a drone of wheezing harmonium and a bouncy beat provided by handclaps and tabla. Crescendos build and build until further escalation seems impossible, but through it all there is no sense of strain. What is present is a sense of deep belief and surrender to religious fervour.

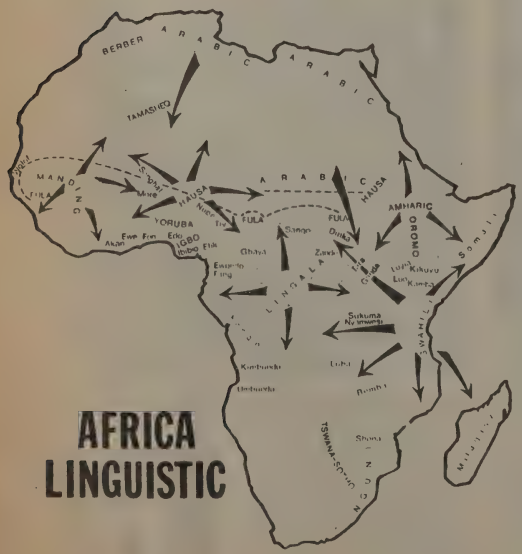
European

Les Negresses Vertes *Mlah* (Sire/Warner Bros. 9 26029-2). From southeastern France. A punchy, dynamic sound that mixes a Celtic/Gypsy/Arabic/rock base into a wailing whirlwind of jumping, riotous, raucous mayhem. Like the clowns at the circus, there's an edge of sadness. Everything's under control, but the surreal wistful tone makes you want to believe that the world is that crazy anyway. The wild party atmosphere of this recording makes it unsuitable for ethnomusicologists.

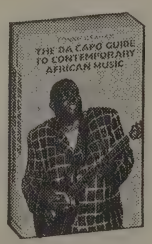
Vujicsics (HNCD 1310). From Hungary. Fiddles and female vocals front over various other strings and reeds for a very frisky dance feel (but not in the bass-heavy urban sense). The singers have some of the same qualities as the vastly overrated Bulgarian ones, but they are sweeter with a lot more life to them, and are balanced by the helter-skelter strings chasing each other all over the place. Plus there is a bagpipe-like skirl, but not so shrill, on some tracks. Really very pleasant, jaunty, and foot-stirring music . . . not that I can dance to it without looking like a prancing prat. ■

Da Capo Guide to Contemporary African Music

This is THE guide for the Africanphile vinyl addict. Covering the huge range of musical styles, traditional and contemporary/modern/popular, from all of sub-Saharan Black Africa, it is astonishingly complete. Each country's music is discussed by style in relation to the political, economic, and social history of the country, bringing to life the many non-musical considerations that influence the artistic expression and development. The trade factors that affect the availability of the recordings here in the North/West are explained. Individual major artists' life stories are covered in reasonable depth, and many lesser-knowns are noted. The discographies that follow make me squirm with my old vinyl jones. Comes complete with bibliography and index. —Jonathan E.



AFRICA LINGUISTIC



Da Capo Guide to Contemporary African Music
Ronnie Graham, 1988; 315 pp.
$13.95 postpaid from Da Capo Press, 233 Spring Street, New York, NY 10013; 800/321-0050 (or Whole Earth Access).

•

For the majority of Europeans, African music remains 'jungle' music, repetitive, boring and primitive. Christian missionaries did their best to stamp it out and the same uninformed and often racist views sadly still prevail today. In the same way, we have seen how western capital, in the form of music multinationals, has attempted to coopt or at least to profit from the current wave of popularity enjoyed by Africa's electric guitar bands. To a lesser extent, we have seen how several western pop musicians have attempted to incorporate African rhythms and styles into their career development. While many observers consider these phenomena to be positive developments in the promotion of African music, we would beg to differ and instead argue that the efforts of Paul McCartney, Brian Eno, David Byrne, Peter Gabriel and Paul Simon are largely meaningless (and often selfish) in terms of the overall development of African music. We only have to consider the fact that over 90 percent of Africans remain in close articulation to pre-capitalist economic and social formations and it is they who provide the great strength and vitality of contemporary African popular music. For the majority of Africans, music remains live and closely tied to their daily lives. The fact that this existence is now under threat from war, famine, invasion and western cultural imperialism in no way diminishes the continuing contribution which Africa makes to the enrichment of our daily lives.

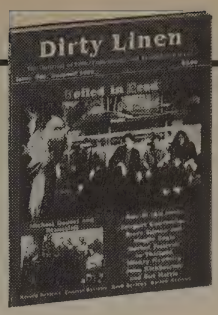
Dirty Linen

This started out as a fanzine for the British folk-rock group Fairport Convention. Over time it grew to cover other British and Celtic folk music. Its readers found French folk music pretty interesting, too. And then Spanish, and Moroccan, and Egyptian tunes . . . Well, the magazine is now subtitled "The Journal of Folk, Folk-Rock, and Traditional Music," and aims to focus a wide-angle lens on contemporary folk music all over the world. It's not quite that global yet (still a lot about British groups), but I know of nothing else with the same reach. Usual music 'zine fair: record, concert, and book reviews. Unusual music range: world-wide folk. —Kevin Kelly

•

Eric Bogle
Singing the Spirit Home
Philo Records (1988)

We have a saying around our house, spawned by too much exposure to Celts and their music. When we are smitten with a particular album, or (rarely) musician, we attest "We've got to bring that one home!" It implies a combined desire to keep the record for posterity and, hopefully, be able to put together a concert from it. We have hundreds to pick from annually and the sign of ultimate approval is an album being enshrined in our personal compact disc case. In three years, about twenty titles have accomplished this. Here's one . . .



Dirty Linen
Paul Harman, Editor
$20 /year (6 issues) from Dirty Linen Ltd., P. O. Box 66600, Baltimore, MD 21239-6600; 301/296-6934.

Heartbeats • Heartsong Review

Musical purists hold their noses when the subject or sound of new-age music comes around. They declare it overly saccharine or, worse, just plain too sleepy. New-age music enthusiasts don't seem to mind; they're buying it up by the cabinetful. The music ranges from placid, environmental backgrounds that are used in relaxation tapes, to traditional spiritual chants (Gregorian, Hindu, and so forth), to the outright spacey, trippy, dreamy, and meditative. Without recognizing it as such, you've probably heard some of the best electronic new-age music on TV as the themes of sports events, on movie sound tracks, or behind TV specials. A grassroots cottage industry of independent cassette producers is feeding this appetite.

Heartbeats peddles by mail the most enduring classics and bestselling cosmic cassettes and CDs. Its catalog is intelligent, informative and based on a syndicated public-radio show of current "space" music, Hearts of Space. ***Heartsong Review*** *(a separate outfit) evaluates, rates, and reviews a wide selection of newly released, and often more obscure and lesser-known, spiritual and inspirational music. They don't sell tapes, only recommendations published twice a year with directions on how to order from the producer.* —Kevin Kelly

HAROLD BUDD & BRIAN ENO "Ambient #2: The Plateaux of Mirror/The Pavilion of Dreams"
Definitely one of our best buys — and best sellers. "Ambient #2," the original space/piano/synthesizer collaboration, now verging on "classic" status, plus "Pavilion of Dreams," an earlier album of slow, dreamy Budd compositions, produced by Eno. Two tapes for the price of one. Very, very mellow.
CASS ONLY $9.98

DAVID LANGE "The Return of the Comet"
Warm, floating electronic harmonies and transteller processions. Music for stargazing, comet tracking, and other celestial pursuits. This continues to be a timeless piece of music from Hearts of Space.
LP *OR* CASS $9.98

—Heartbeats

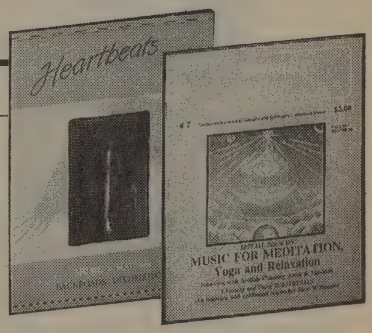
ROBERT GASS ON WINGS OF SONG

Kyrie
O Great Spirit

***/ CO GR/ C, NA

"Lord have mercy" is the meaning of the two Greek words which are sung throughout ***Kyrie,*** the first of these extended chant albums. Twenty two harmonious, uplifting voices sing *Kyrie Elesion* in the traditional melody, which is sung at the beginning of the traditional Catholic mass. Synthesizer, acoustic guitar, tabla, congas and cymbals lend it a lovely structure, rich and full of longing. Heartfelt simple asking, deep pleading to the Divine and the granting of mercy can be felt through the beautiful swelling voices, repetitive rhythms and melody. It will leave you cleansed and filled with peace.

—Heartsong Review



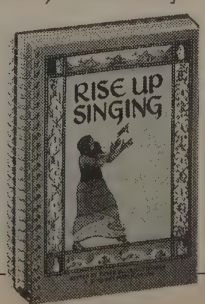
Heartbeats
Catalog **free** from Backroads Distributors, 417 Tamal Plaza, Corte Madera, CA 94925; 800/825-4848.

Heartsong Review
$6 (2 issues) from Heartsong Review, P. O. Box 1084, Cottage Grove, OR 97424.

Rise Up Singing

Get out your old guitar. Twelve hundred tunes in simple chord notation are jammed into this durable spiral-bound book. From "Wayfaring Stranger" to "Fly Me to the Moon" to "Mr. Bojangles" to "My Favorite Things" to "With a Little Help From My Friends" and all points in between. I'd wager my Guild flattop that there isn't one person reading this who couldn't find ten songs they liked inside of three minutes. (It's thoroughly indexed to help you locate what you're looking for.)

I've been playing guitar and singing tunes for 24 years and this is the best little songbook I've seen. —John Coate
[Suggested by Jared Jones]



Puff (the Magic Dragon)

Puff, the magic dragon, lived by the sea
And frolicked in the autumn mist in a land called Honalee
Little Jackie Paper loved that rascal Puff
And brought him strings & sealing wax & other fancy stuff
O-Puff... (cho = 1st 2 lines repeated twice)

G D(Bm) C G/C G A D/ 1st /C GEm AD GD

Together they would travel on a boat with billowed sail
Jackie kept a lookout perched on Puff's gigantic tail
Noble kings & princes would bow whene'er they came
Pirate ships would lower their flags when Puff roared out his name

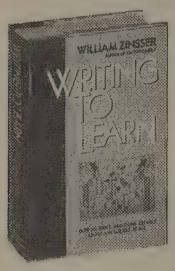
A dragon lives forever, but not so little boys
Painted wings & giants' rings make way for other toys
One gray night it happened, Jackie Paper came no more
And Puff that mighty dragon, he ceased his fearless roar
His head was bent in sorrow, green scales fell like rain
Puff no longer went to play along the cherry lane
Without his lifelong friend, Puff could not be brave
So Puff that mighty dragon sadly slipped into his cave
– Peter Yarrow & Leonard Lipton

Rise Up Singing
Peter Blood-Patterson, Editor
1988; 279 pp.
$15 ($17.50 postpaid) from Sing Out Corporation, P. O. Box 5253, Bethlehem, PA 18015; 215/865-5366.

Writing to Learn

If you want to use writing as a way of knowing as well as communicating, add to your writing tool kit William Zinsser's ***Writing to Learn****. It seems to say everything worth saying about writing as a way of thinking and growing and learning.*

—Dale Roberts



Writing to Learn
William Zinsser, 1988; 256 pp.
$6.95 ($10.45 postpaid) from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

•

Probably no subject is too hard if people take the trouble to think and write and read clearly. Maybe, in fact, it's time to redefine the "three R's" — they should be reading, 'riting and reasoning. Together they add up to learning. It's by writing about a subject we're trying to learn that we reason our way to what it means.

•

Writing organizes and clarifies our thoughts. Writing is how we think our way into a subject and make it our own. Writing enables us to find out what we know — and what we don't know — about whatever we're trying to learn. Putting an idea into written words is like defrosting the windshield: The idea, so vague out there in the murk, slowly begins to gather itself into a sensible shape. Whatever we write — a memo, a letter, a note to the baby-sitter — all of us know this moment of finding out what we really want to say by trying in writing to say it.

•

I don't like to write, but I take great pleasure in having written — in having finally made an arrangement that has a certain inevitability, like the solution to a mathematical problem. Perhaps in no other line of work is delayed gratification so delayed.

•

"Reading, writing and thinking are all integrated," said Kevin Byrne, associate professor of history. "An idea can have value in itself, but its usefulness diminishes to the extent that you can't articulate it to someone else.

•

Writing is thinking on paper. Anyone who thinks clearly should be able to write clearly — about any subject at all.

Writing a Woman's Life

Carolyn Heilbrun is a feminist scholar who is also Amanda Cross, author of the wonderful Kate Fansler mysteries. ***Writing*** *is about the narratives that have defined women's lives until now, and how women may finally be able to start constructing new narratives for themselves. Although a bit literary (fine with me), the book is not a scholarly treatise and is, in fact, very readable. And Heilbrun's explanation of her creation of Amanda Cross and the Fansler novels adds just enough of the personal to turn scholarship into meaningful argument.*

—Cynthia Rymer

•

For women who wish to live a quest plot, as men's stories allow, indeed encourage, them to do, some event must be invented to transform their lives, all unconsciously, apparently "accidentally," from a conventional to an eccentric story. George Eliot took herself abruptly out of the conventional plot by committing herself to live, as if in marriage, with George Henry Lewes, who could not divorce his legal wife. It was a relationship utterly abhorrent to Victorian morality. By one outrageous act she escaped social demands, the compulsion to motherhood, and despair at her lack of accepted sex appeal; by the same act she satisfied her sexual desires, her need for a certain dependency, and, above all, her need for space in which to work.

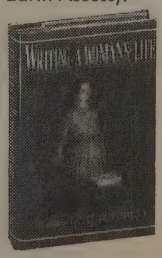
•

Romances, which end when the woman is married at a very young age, are the only stories for women that end with the sense of peace, all passion spent, that we find in the lives of men. I have read many moving lives of women, but they are painful, the price is high, the anxiety is intense, because there is no script to follow, no story portraying how one is to act, let alone any alternative stories.

•

Despite the wonderful biographies we have had in recent years, there still exists little organized sense of what a woman's biography or autobiography should look like. Where should it begin? With her birth, and the disappointment, or reason for no disappointment, that she was not a boy?

Writing a Woman's Life
Carolyn G. Heilbrun, 1988; 144 pp.
$14.95 ($16.45 postpaid) from W. W. Norton, 500 5th Avenue, New York, NY 10110; 800/223-2588 (or Whole Earth Access).



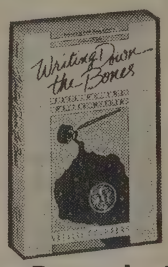
Writing Down the Bones

I usually don't like books about writing, because they make it seem too easy. To my mind, Red Smith said it best: "There's nothing to writing. All you do is sit down at a typewriter and open a vein."

Natalie Goldberg takes a different approach, which doesn't deny the difficulty but doesn't romanticize it, either. "Writing down the bones" means capturing the "essential, awake speech" of our minds. Goldberg encourages an attention to first thoughts, "where energy is unobstructed by social politeness or the internal censor," so that "you are writing what your mind actually sees and feels, not what it ***thinks*** *it should see or feel."*

Her book is a lively, honest, and compassionate guide — and a pleasure to read.

—Sy Safransky [From ***The Sun****]*



Writing Down the Bones
(Freeing the Writer Within)
Natalie Goldberg, 1986; 171 pp.
$8.95 ($10.95 postpaid) from Shambala Publications, Inc./Attn.: Order Dept., 300 Massachusetts Avenue, Boston, MA 02115; 617/424-0030 (or Whole Earth Access).

•

1. *Keep your hand moving.* (Don't pause to reread the line you have just written. That's stalling and trying to get control of what you're saying.)

2. *Don't cross out.* (That is editing as you write. Even if you write something you didn't mean to write, leave it.)

3. *Don't worry about spelling, punctuation, grammar.* (Don't even care about staying within the margins and lines on the page.)

4. *Lose control.*

5. *Don't think. Don't get logical.*

6. *Go for the jugular.* (If something comes up in your writing that is scary or naked, dive right into it. It probably has lots of energy.)

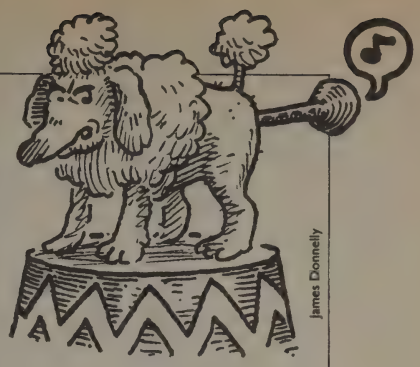
•

Be specific. Don't say "fruit." Tell what kind of fruit — "It is a pomegranate." Give things the dignity of their names. . . . It is much better to say "the geranium in the window" than "the flower in the window." "Geranium" — that one word gives us a much more specific picture. It penetrates more deeply into the beingness of that flower. It immediately gives us the scene by the window — red petals, green circular leaves, all straining toward sunlight.

GETTING UNSTUCK

Forty-five ways to smash writer's block

BY GREGORY McNAMEE



1. Read something you'd never dream of reading: even Richard Nixon's memoirs.
2. Listen to something new and unexpected.
3. Ask yourself if you may be trying to say too much.
4. Write the last sentence of your piece. Think backwards to where you're stuck. How does it fit?
5. Find the best word in your piece. Insert it where you're stuck. How does it feel in its new location?
6. Just imagine how you'd feel if your piece caught fire.
7. Lie on the floor, pillowless. Suffer for your art.
8. Stare at the sky.
9. Accept a distraction.
10. Consider the next point on your journey. Why now, of all times, are you standing still?
11. Listen to a favorite song, or even a song you detest.
12. Write something, anything – a recipe, a love or hate letter, a poem, a shopping list – in the white space where you're stuck.
13. Find the information you're missing.
14. Change rooms.
15. Do something so dull that your mind will scream to get back to writing. Washing the car, watching religious broadcasting, or working on your tax return are all good candidates.
16. Ask yourself if you like what you're doing. If not, stop.
17. Talk yourself over the spot where you're stuck. Then write what you learn – fast.
18. Put your notes in a drawer. Shun them for a while.
19. Sprint! Write anything, anything, as fast as you can for five minutes.
20. Breathe. (Apologies to Yoko.)
21. Call someone you love. Ask that person how to proceed. Chances are you'll have the right answer in no time.
22. Deny yourself absolutely nothing. Start with first-rate tools.
23. Stretch.
24. Fool yourself.
25. Delight yourself.
26. Listen to your narrator. How would s/he get out of this jam? What would Ahab do?
27. Write a one-sentence precis of your piece, striving for exactly the right words. Where are you in that sentence?
28. Eat something hot, just as Satchel Paige said.
29. Fill the page with a picture of the thing you're trying to get at. Spare no detail whatever.
30. Tell yourself why you're stuck.
31. Change writing tools. If you're writing on a computer, switch it off and find a pencil.
32. Know yourself.
33. Think the clearest thought you can.
34. Walk somewhere. Put one thing from your walk into the text, right where you're stuck.
35. Imagine the look on your reader's face.
36. Work on something new.
37. Stop: but only in mid-sentence, where you can pick up next time.
38. Write in a different direction on the page.
39. Imagine the exhilaration of finishing, the rewards you'll shower on yourself for having gone the distance.
40. Close your eyes.
41. Sit quietly, ignoring the problem.
42. Read something unconnected to what you're working on. Louis Pasteur: ''Chance favors the prepared mind.''
43. Reverse all engines.
44. Chase down the Muse. Then do exactly as she says.
45. Remember that writer's block is nothing more than a failure of nerve. But don't let that bother you. ■

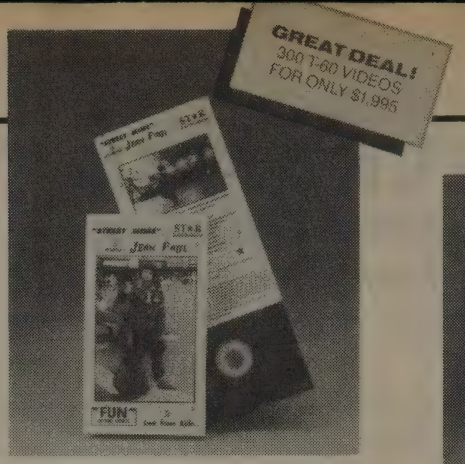
The author originally issued this list in a self-published newsletter, Sandstorm, *available for an SASE. Following a highly positive review in the 'zine directory* Factsheet Five *(WER #57, p. 47), he received an unusually large number of requests for it, encouraging him to try us.*

–Kevin Kelly

Disc Makers

In the Information Age, as conventional wisdom goes, manufacturing loses because it becomes trivially easy to copy products digitally, disk to disk or tape to tape. Yeah? What do you do if you need 1,000 cassettes? By next week? You turn to a short-run replicator. Disc Makers works by phone, UPS and Federal Express. They reproduce small lots of cassette tapes, LPs, videotapes, and compact discs, with printed color covers and cases if you want. —Kevin Kelly

Disc Makers: Catalog **free** from Disc Makers, 1328 N. 4th Street, Philadelphia, PA 19122; 800/468-9353.



Professional Series hi-fi stereo VHS duplication with full color cardboard slip case. Includes Mastering, Video Duplication, Printed Label, Full Color Photo on Slip Case, and Poly Wrap.

Power Up!

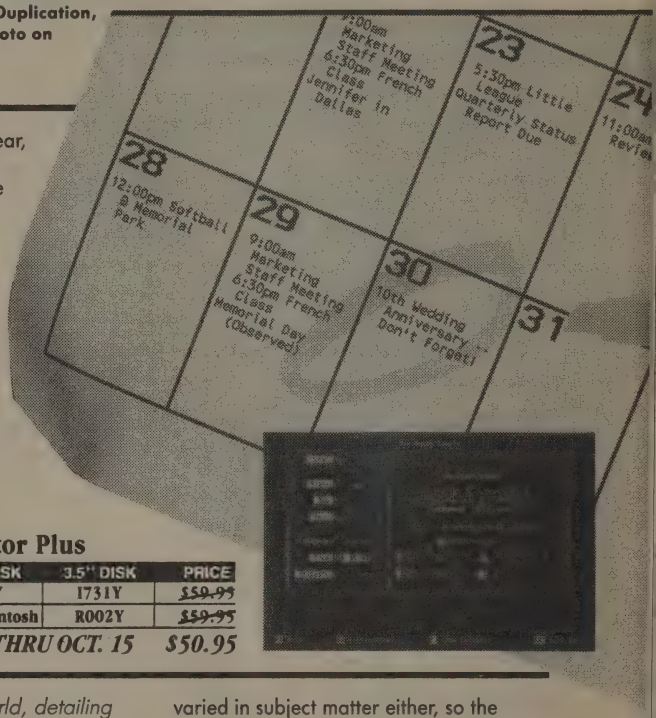
A catalog of reasonably priced software for office work. These IBM PC-based programs specialize in accomplishing those humdrum but necessary support tasks in company life such as calendar-, address-book-, banner-, label- and name-badge-making. —Kevin Kelly

Power Up!: Catalog **free** from Power Up! Software Corporation, P. O. Box 7600, San Mateo, CA 94403-7600; 800/851-2917.

•

You can enter unique, recurring, and *floating* events — recurring events without regular dates (office meetings every Monday, or club meetings on the last Thursday of the month, for example). You can also enter and sort events by time, control the order in which events appear, and create exceptions to floating events — when the office doesn't meet on the Monday of Memorial Day, for example.

The program even counts birthdays and anniversaries by automatically incrementing entries like "John's 35th Birthday" and "10th Wedding Anniversary."



Calendar Creator Plus

SYSTEM	5.25" DISK	3.5" DISK	PRICE
IBM	1031Y	1731Y	~~$59.95~~
Calendar Creator/Macintosh		R002Y	~~$59.95~~

SAVE 15% NOW THRU OCT. 15 ***$50.95***

Holography Marketplace 1989

The situation in holography can be likened to the early situation of photography. Who, back in 1860, would have been able to predict the many applications for that curious, then-experimental technique in the present-day world? Since holography is essentially a high-fidelity three-dimensional form of photography, it is likely to increasingly supplant and supersede photography in many current uses. But getting to know the major players and factors in this exciting and explosive field of optics (often lumped together with other light-based explorations into a new science called photonics) can be difficult, frustrating, and time-consuming. That's why this book, put out by the publishers of ***The Holography Handbook****, is so helpful.*

Holography Marketplace 1989 *is largely the compilation of responses to a questionnaire sent to holographic artists, producers, manufacturers, vendors and educators all over the world, detailing their range of services and products, along with other pertinent data.*

For a person wanting to buy a hologram or to set up a holographic lab at home or at school, this compendium offers sensible advice and contacts. For an individual or company wanting to commission custom holographic work, either limited-edition or mass-produced, there is a chapter on both 2-D and 3-D artwork, image reduction, and the use of recording material. This is important technical information not usually found outside industry proceedings journals. —Carl Macki

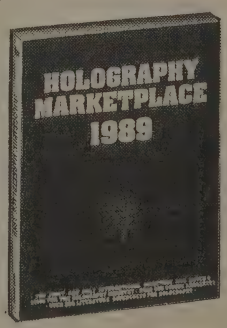
•

Dichromate reflection holograms under $10

The dichromate reflection holograms that have entered the under-ten-dollar retail bracket are sometimes bright, sharp and even interesting. Sometimes they're not. At these prices the subject matter is limited but hopefully this will change soon. To be quite honest, the holograms at the next price level up are not very lively and varied in subject matter either, so the lower price is at least some good news.

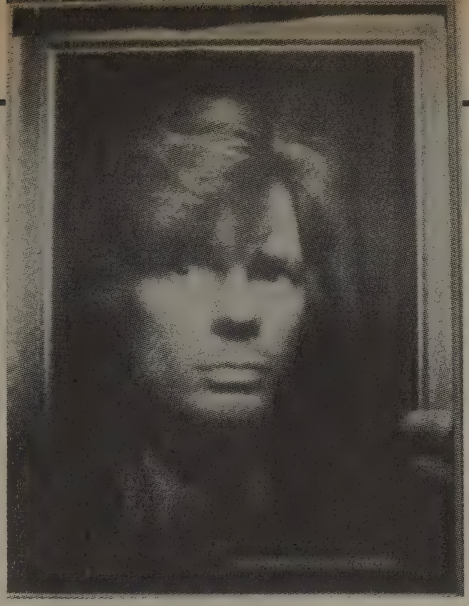
Holography Marketplace
Franz Ross and Elizabeth Yerkes, Editors
1989; 179 pp.

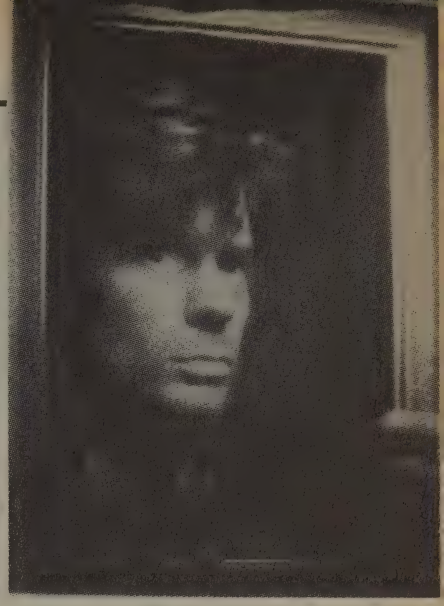
$35 ($37.80 postpaid) from Ross Books, P. O. Box 4340, Berkeley, CA 94704; 800/367-0930.



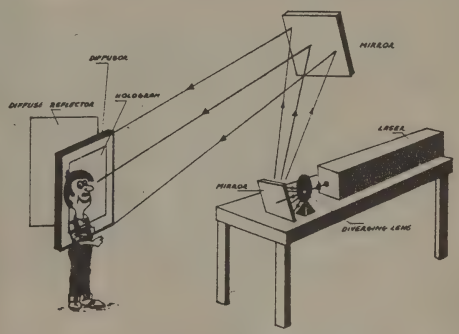
Leonardo

This highbrow and occasionally pompous "Renaissance" quarterly presenting integrated views of art, science and technology, explores the tender undercurrents and resonances of the relatively new art medium of holography in a special double issue, edited by Louis M. Brill. ***Leonardo*** *has pioneered in its coverage of the high-fidelity, three-dimensional imaging process from the personal standpoint of the artist before. Here and now the context is grander: some of the leading lights in display holography from all over the world are represented in over thirty contributions, whose contents include personal accounts, descriptions of collaborations, holography's role among mixed media, its usefulness for education in stimulating "holo perception," technical notes, perspectives on future research, and various critiques and personal views. The scope covers experiments in developing holographic poetry, holosculpture, and other extensions into three dimensions.* —Carl Macki





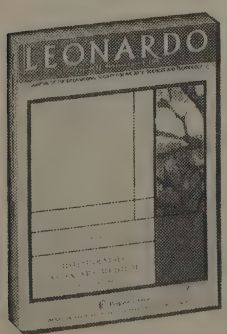
Boggs, **reflection hologram, 30 x 40 cm, 1987 (two views). Infamous for his realistic renditions of pound notes and dollar bills, Boggs seemed an ideal candidate to depict with a ruse. This was done tongue in cheek by having him hold an ornate gold frame up to his face; but the viewer is not fooled, because his action is plainly visible just inside the actual ornate frame of the hologram.**



Setup used for making portraits. A diffusor with a small scatter angle is introduced between the hologram and the subject.

Cosmetic Series: Flora, **reflection hologram and gouache painting, 30 x 40 cm, 1986. The emphasis on painting the face in the recording stage of the pulsed hologram is carried through to the hologram's final presentation by its fusion with a painted image of the same face. A mixture of additive and subtractive colours produces a new, subtle range of tints.**

Leonardo
$45 (Vol. 22, nos. 3 & 4: double issue);
$40 (1-year subscription, includes Vol. 22 in 1990) from I.S.A.S.T., 1442A Walnut Street/Box 75, Berkeley, CA 94709; 415/845-8306.



GrandView

This word processor/data manager is optimized to help with the tedium of writing: gathering bits and pieces of text and notes, shuffling them in ever-more-intricate patterns, and melding them into a final whole. After trying perhaps a dozen word-processing programs in depth during the past two years, on both MS-DOS and Mac computers, I settled on this, because of its many amenities for restructuring and organizing. Just one example: compose an outline at the top of a disorganized document. Then, riffle through your jumble of text, touching the "F4" key to instantly transfer a particular segment of text to any spot in your outline.

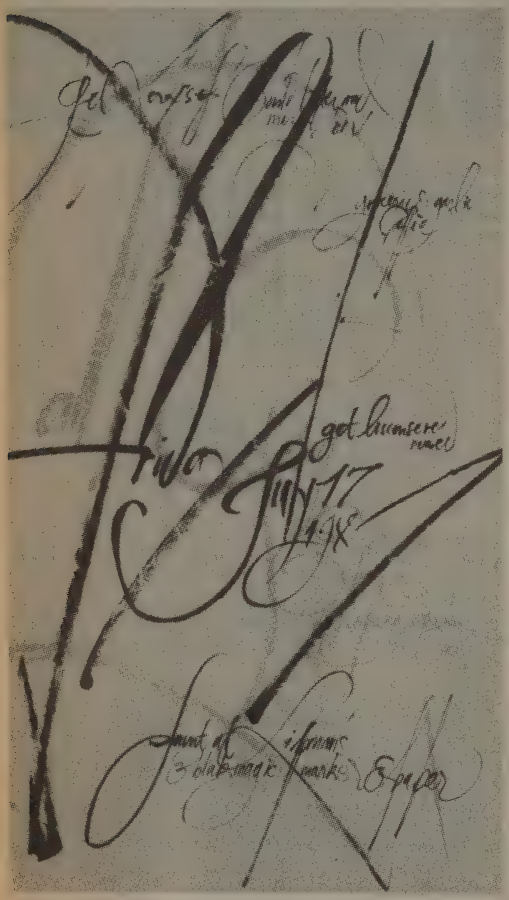
GrandView also has a good spelling checker, highly intuitive commands (which you can completely redefine), great mouse controls (ditto), an automatic time stamp, your own defined fonts (based on your printer), and a system of assigning "categories" to notes in case you want to build a cross-referenced library of thoughts. Written by Jon Friend (of PC-Outline) and midwifed by Dave Winer (of More! and Thinktank), this outliner-derived program is the only writing software I've ever used that meets my composing style halfway.
—Art Kleiner

GrandView: $189. For IBM PC. From PC Connection, 6 Mill Street, Marlow, NH 03456; 800/243-8088.

Calligraphy Review

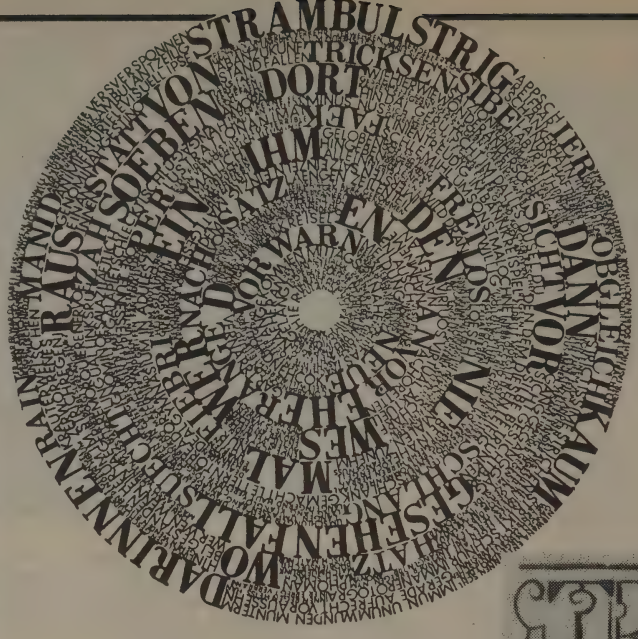
A beautifully produced magazine that presents words at their most beautiful. ***Calligraphy Review*** *combines a scholarly attitude towards the historic and a showcase for modern artists using letterforms in their work. This magazine covers a wide range of styles and forms including sculpture, ceramics and signage, creating inspiration for the amateur and community for the professional.*

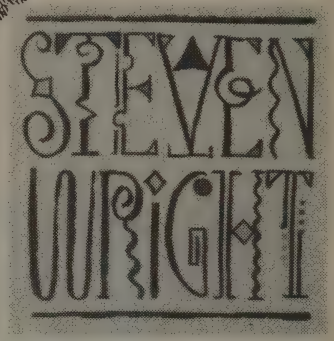
—Kathleen O'Neill



Things to do July 17th. **Brush and sumi ink on two layers of Unryu paper. 24 x 39**

Calligraphy Review
Karyn Lynn Gilman, Editor
$36/year (4 issues) from Calligraphy Review, 1624 24th Avenue SW, Norman, OK 73022; 405/364-8794.





(Above) A modern version of pattern poetry by the German artist/poet Ferdinand Kriwett.

(Right) Margo Chase's album cover logo for comedian Steven Wright. Felt-tip brush marker on rough paper; color from cut rubylith added in printing.

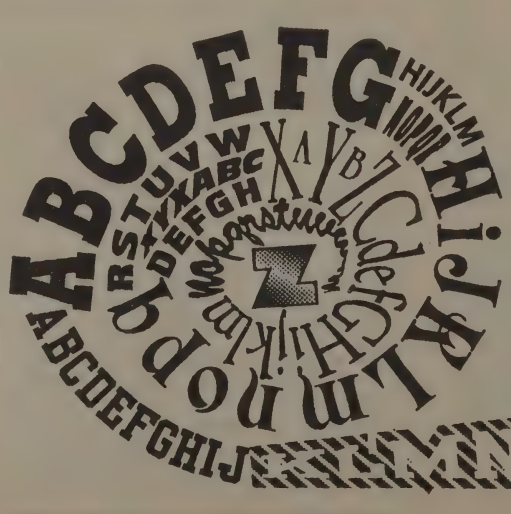
TypeStyler

An easy-to-use program that lets you manipulate type in an almost endless number of ways. Outlines, shadows, curves, dips, perspective, shading, layering, and . . . You can also save the type as an Illustrator file for creating your own swash caps or ligatures.

One of the things I really appreciate is that I can print these files as smooth non-jagged letters without the font residing on my printer. The files place easily into PageMaker, giving me a much greater range of typestyles for titles. The program comes with ten Smoothfonts, and you can convert PostScript fonts into Smoothfonts.

TypeStyler does eat up a lot of memory while you're working and my basic SE gets pretty slow, but the results are worth the wait. *—Kathleen O'Neill*

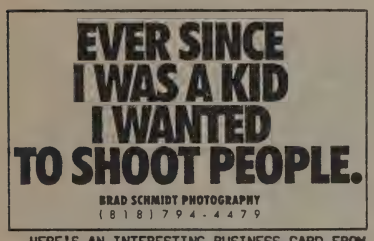
TypeStyler
$199.95 (requires Macintosh with hard disk or two 800K floppy disk drives). From Broderbund, P. O. Box 12947, San Rafael, CA 94913; 800/521-6263.



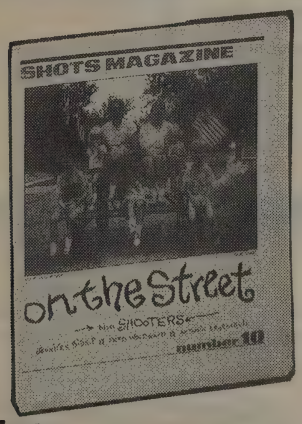
Shots

Remember when you first looked through the viewfinder of a camera and it made the world look different, and new, and wonderful, and infinitely more fascinating than the real thing? And it wasn't until you made a print of the shot of your brother standing in the doorway with sunlight on his hair that you saw that he was actually an angel with a halo?

The photography in this newsprint tabloid (can you imagine ***Aperture*** *printing on newsprint?) made me want to fool around with photography again. One issue was dedicated to photographs made with toy cameras, and another to old photographs found in attics and archives. Nothing serious, just cheerful magic for the inner eye. —Kevin Kelly*



HERE'S AN INTERESTING BUSINESS CARD FROM A PHOTOGRAPHER IN SOUTHERN CALIFORNIA!



Shots
Dan Price, Editor

$12/year (6 issues) from Shots Magazine, 304 S. 4th Street, Danville, KY 40422; 606/236-9414.

"This photograph was called disgusting by one of the City Paper readers. I was driving to the beach in Delaware and spotted the horse so backtracked about a quarter of a mile and began to photograph when this white cat came up and started bugging me. So I decided to throw the cat into the picture and I kept running back to take it, but the cat just kept running back to me!"

"Sometime in 1983 I decided I wanted to photograph a wedding just for myself. So I found some people in Baltimore who I didn't know. They kindly allowed me to photograph their wedding and later I sent them a bunch of pictures, and I never did hear from them. They must not have liked them."

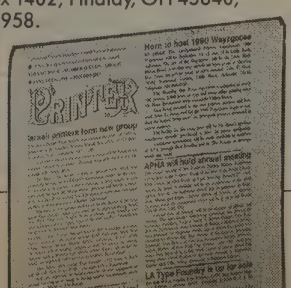
The Printer

It may seem like desktop publishing, phototypesetting, and offset printing have wiped out earlier methods, but there are still some rebels out there. ***The Printer*** *is a monthly broadsheet for letterpress printers; its subtitle is "Where History is Recorded and Heritage is Reclaimed." Besides news of people still doing it the old-style way, there are book reviews, articles on the art of typesetting (too often forgotten in these days when words are rarely cast in lead), and lots of wants and sales of presses, wood type, six-point slugs and the rest.*

—Kathleen O'Neill

The Printer
Michael James Phillips
and Sally Louise Phillips, Editors

$20/year (12 issues) from The Printer, Box 1402, Findlay, OH 45840; 419/422-4958.



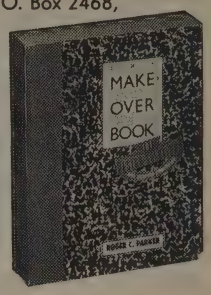
The Makeover Book

A large part of design is visual organization so people see what you're trying to tell them. Your charts or flyers don't have to win design prizes, but they do have to communicate to do the job.

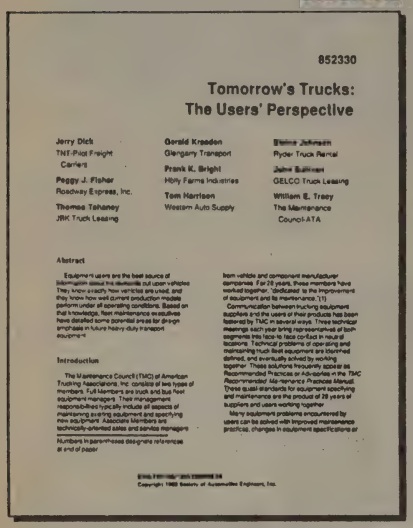
As with writing, there are certain rules and vocabulary that help. ***The Makeover Book*** *gives basic rules to follow but, better yet, gives lots of real examples of brochures, newsletters, ads, etc. For each example there is a Before, with its problems pointed out, and a Makeover with reasons for the changes that were made.*

Although presented as "101 design solutions for desktop publishing" — and all the examples are applicable there — this book could be useful to any small business or organization presenting itself in print to the public. —Kathleen O'Neill

The Makeover Book
Roger C. Parker, 1989; 278 pp.
$17.95 ($21.55 postpaid) from Ventana Press, P. O. Box 2468, Chapel Hill, NC 27515; 919/942-0220.



ORIGINAL



852330

Tomorrow's Trucks:
The Users' Perspective

Jerry Dick
TNT-Pilot Freight Carriers

Peggy J. Fisher
Roadway Express, Inc.

Thomas Tahaney
JBK Truck Leasing

Gerald Kreeden
Glengarry Transport

Frank K. Bright
Holly Farms Industries

Tom Harrison
Western Auto Supply

Elaine Johnsen
Ryder Truck Rental

John Sullivan
GELCO Truck Leasing

William E. Tracy
The Maintenance Council-ATA

Abstract

Equipment users are the best source of information about the elements put upon vehicles. They know exactly how vehicles are used, and they know how well current production models perform under all operating conditions. Based on that knowledge, fleet maintenance executives have detailed some potential areas for design emphasis in future heavy-duty transport equipment.

Introduction

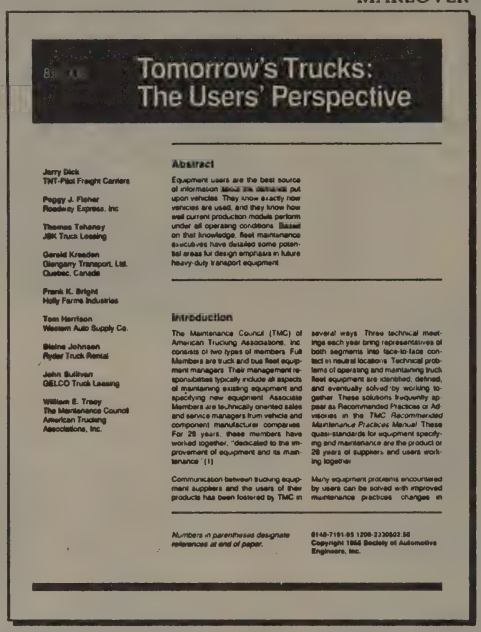
The Maintenance Council (TMC) of American Trucking Associations, Inc. consists of two types of members. Full Members are truck and bus fleet equipment managers. Their management responsibilities typically include all aspects of maintaining existing equipment and specifying new equipment. Associate Members are technically-oriented sales and service managers from vehicle and component manufacturer companies. For 28 years, these members have worked together, dedicated to the improvement of equipment and its maintenance. (1)

Communication between trucking equipment suppliers and the users of their products has been fostered by TMC in several ways. Three technical meetings each year bring representatives of both segments into face-to-face contact in neutral locations. Technical problems of operating and maintaining truck fleet equipment are identified, defined, and eventually solved by working together. These solutions frequently appear as Recommended Practices or Advisories in the *TMC Recommended Maintenance Practices Manual*. These quasi-standards for equipment specifying and maintenance are the product of 28 years of suppliers and users working together.

Many equipment problems encountered by users can be solved with improved maintenance practices; changes in equipment specifications or

Numbers in parentheses designate references at end of paper.

Because the information all looks the same, readers don't know what to read first—and often skip it altogether!



Tomorrow's Trucks:
The Users' Perspective

Jerry Dick
TNT-Pilot Freight Carriers

Peggy J. Fisher
Roadway Express, Inc

Thomas Tahaney
JBK Truck Leasing

Gerald Kreeden
Glengarry Transport, Ltd.
Quebec, Canada

Frank K. Bright
Holly Farms Industries

Tom Harrison
Western Auto Supply Co.

Elaine Johnsen
Ryder Truck Rental

John Sullivan
GELCO Truck Leasing

William E. Tracy
The Maintenance Council
American Trucking
Associations, Inc.

Abstract

Equipment users are the best source of information about the elements put upon vehicles. They know exactly how vehicles are used, and they know how well current production models perform under all operating conditions. Based on that knowledge, fleet maintenance executives have detailed some potential areas for design emphasis in future heavy-duty transport equipment.

Introduction

The Maintenance Council (TMC) of American Trucking Associations, Inc. consists of two types of members. Full Members are truck and bus fleet equipment managers. Their management responsibilities typically include all aspects of maintaining existing equipment and specifying new equipment. Associate Members are technically-oriented sales and service managers from vehicle and component manufacturer companies. For 28 years, these members have worked together, dedicated to the improvement of equipment and its maintenance. (1)

Communication between trucking equipment suppliers and the users of their products has been fostered by TMC in several ways. Three technical meetings each year bring representatives of both segments into face-to-face contact in neutral locations. Technical problems of operating and maintaining truck fleet equipment are identified, defined, and eventually solved by working together. These solutions frequently appear as Recommended Practices or Advisories in the *TMC Recommended Maintenance Practices Manual*. These quasi-standards for equipment specifying and maintenance are the product of 28 years of suppliers and users working together.

Many equipment problems encountered by users can be solved with improved maintenance practices; changes in

Numbers in parentheses designate references at end of paper.

0148-7191-88 1208-2330$02.50
Copyright 1988 Society of Automotive Engineers, Inc.

The title is placed in a modified nameplate, set comfortably apart from the body copy.

Again, speakers' names are placed to the left, away from more important "selling" information.

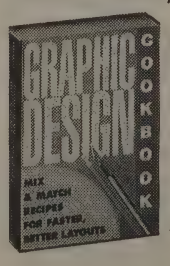
Note how the simple use of rules and columns highlights the important Abstract copy.

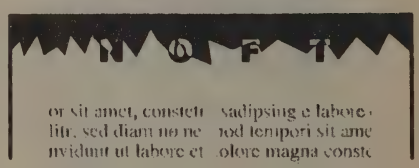
Graphic Design Cookbook

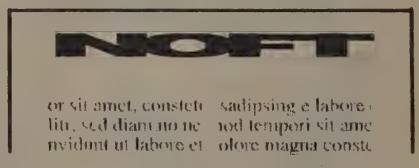
Ten years ago, a wild magazine thrashed out of southern California and seriously warped the careers of certain writers and designers all over the world. ***WET****, the Magazine of Gourmet Bathing, originally founded as a way to entertain a group of young artists who got together for theme bathing parties, set in motion a whole design paradigm from its funky offices in the heart of Venice. I wrote articles for them that nobody else would touch: essays on insect sexual behavior, for example. I remember one afternoon when I sat on a stool in the corner and watched* ***WET*** *publisher Leonard Koren and his art director, Wippo, throw out all the rules for magazine design and come up with something fresh and weird for their next issue. They definitely had their own cryptic system. The magazine died long ago, but* ***WET*** *alumni are now art-directing a surprising proportion of magazines and advertising agencies.*

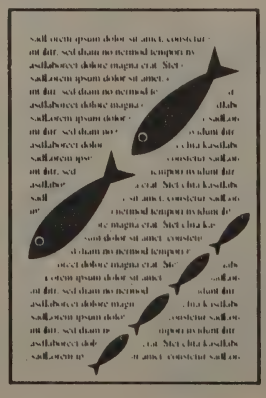
Leonard Koren and R. Wippo Meckler have teamed up again to create a kind of cookbook of ideas — an evolved version of their original cryptic system. It is more of a creative design springboard and nonlinear inspiration source than a book of templates, although one could certainly design a newsletter or magazine or brochure by directly mixing and matching the visual recipes. Each page has a theme, such as "progressive page bordering devices," "kicker devices," "two-column regular text blocks," "pull-quote systems," "cataloging systems," "division of page into rectangular blocks," "image treatments." Instead of clipping creative visual design ideas from a thousand magazines, you can flip through this book, and let the pages do something to your mind. —Howard Rheingold

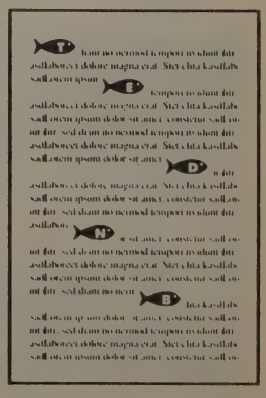
Graphic Design Cookbook
Leonard Koren and R. Wippo Meckler, 1989; 142 pp.
$12.95 ($14.95 postpaid) from Chronicle Books, 275 5th Street, San Francisco, CA 94103; 415/777-7240 (or Whole Earth Access).











Dissertation Abstracts International

The purpose of a doctoral dissertation is to introduce an original contribution to knowledge. Although it is doubtful whether all dissertations meet this rather lofty goal, becoming aware of the over 35,000 dissertations written every year can give you an idea of the current trends in a field or where a particular discipline is headed. ***Dissertation Abstracts International*** *publishes abstracts of dissertations in a monthly index. Included in the abstracts are the author's name, title of dissertation, institution where the work was done, and a short description of the work. These abstracts can be fascinating, incomprehensible, or unintentionally amusing (there may be a correlation between the length of the title and the silliness of the research topic). Sometimes they are all three.* ***UMI*** *also provides a service where the entire dissertation can be ordered. Be warned, however, that dissertations are not usually page-turners.*

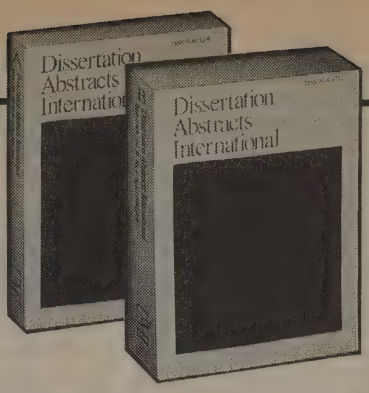
—Lynn Kear

•

Crossing the gender line: Female novelists and their male voices. Wolpert, Ilana Paula, Ph. D. *The Ohio State University,* 1988. 210pp. Adviser: Barbara Rigney
Order Number DA 8820373

In contrast to the many novels written by men in which a female character is at the center of the action — *Moll Flanders, Clarissa, Madame Bovary, Anna Karenina, Tess of the D'Urbervilles, The Scarlet Letter, The Portrait of a Lady,* to name only a few — very few women writers have attempted to write novels which would force them to see the world through the eyes of a man. This dissertation looks at the work of five of the female novelists who, engaging in what Emily Ellison and Jane B. Hill call "crossover writing," have attempted to imagine male protagonists.

In Charlotte Bronte's first person narrative, *The Professor,* she speaks through the character of William Crimsworth, an insecure young schoolteacher who serves, in this first of Bronte's novels, as a prototype for her later heroines, Jane Eyre and Lucy Snowe. George Eliot creates in Adam Bede and Daniel Deronda, the title characters of two of her novels, male figures with whom she can closely identify, figures who share her values and morals. Through the depictions of a male tyrant and a male victim, Virginia Woolf conveys her sense that the world is made a dangerous place for everyone, male and female alike, through the brutality of patriarchy. Toni Morrison writes in *Song of Solomon* from the point of view of Milkman Dead, a young black man who has to piece himself together by retrieving the fragments of his past and learning lessons from men and women alike, while in *Celestial Navigation* Anne Tyler penetrates the consciousness of Jeremy Pauling, an extremely frightened artist who is out of touch with the real world, living instead inside a world of his own making. Both Milkman and Jeremy are groping for a way to be men at a time when sexual roles are shifting and becoming increasingly complicated.



Dissertation Abstracts International
free from UMI, 300 N. Zeeb Road, Ann Arbor, MI 48106-1346; 800/521-3042.

The main objective of this study is to examine the male protagonists created by women in the light of changes over time which affect the expectations surrounding sexual roles. These changes, which over the course of two centuries have widened the possibilities for crossover writing, are gradually inviting larger numbers of women writers to attempt imaginative identification with a male protagonist.

Livingston Lending Library

Once upon a time we reviewed a service that lent alternative books by mail. They went out of business. Livingston Lending Library has moved into their niche. For 75¢ to $2 you can borrow the kind of books we review from them. Let us know how it works out. *—Kevin Kelly*

Livingston Lending Library
Membership
$10 (one-time fee) from Livingston Lending Library, 20 The Farm, Summertown, TN 38483.

GUERRILLA CAPITALISM		172pg	$10	1.00
How to Practice Free Enterprise In an Unfree Economy. The specific enterprises that are best suited to the 'guerilla capitalist' are described in detail.				
GO HIRE YOURSELF AN EMPLOYER	Richard Irish	238pg	$4.50	.75
If you're in the job market, there are things in here that you need to know...				
THE JOB SHARING HANDBOOK	Olmstead/Smith	200pg	$7	.75
New Strategies for Life & Work in the 1980's.				
ROBERT GERGERS'S JOB CHANGING SYSTEM		264pg	$8	.75
Practical, sensible, detailed advice. Aimed primarily at people in 'executive' level positions.				

London Calling

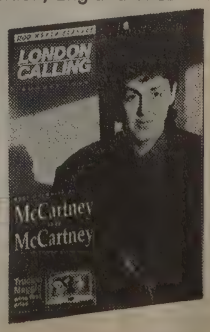
As an American living in Iceland, the BBC is my informational bread and butter. Plenty of hard news, as well as regular programs like "Development '89," "The Farming World," "Mediawatch," "Nature Now," "New Ideas," "Popscience," "Science in Action" . . .

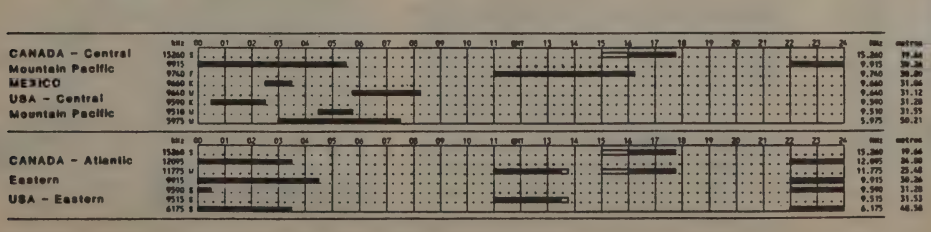
The Beeb is now being carried by cable tv stations in America, which means that millions of Americans can tune in to a digital satellite signal without having to worry much about things like sunspots and ionosphere disturbances. Lucky them.

London Calling *is the monthly guide to the BBC World Service. It is packed with schedules and previews for the month to come . . . a handy magazine for extracting maximum listening pleasure.*

—Jonathan Byron

London Calling
Steve Weinman, Editor
$15 (year (12 issues) from London Calling, P. O. Box 76/Bush House, Strand, London, England WC2B 4PH.

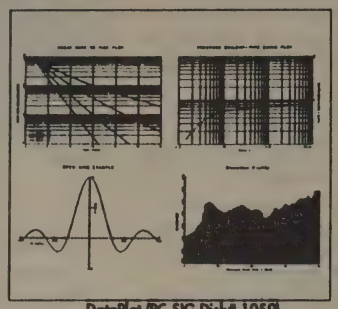




PC-SIG Encyclopedia of Shareware

Sold as a master directory of shareware computer programs, this book is more like a grand testament to vernacular genius in the late 20th century. It's a catalog of over 1,500 computer programs, each written by someone who needed help and couldn't wait for a committee to design it. The passionate, clever endeavors of these folks range from the mundane to the brilliant. All run on the people's computer, the "IBM Compatible," and all are cheap. Most of them are being passed around within the Great Collective Swap Meet of user groups and BBS stations. They are duly collected and annotated by this for-profit mega-user group, PC-SIG, into a book of our times, a kind of ***Software Without Architects****.*

—Kevin Kelly



DataPlot (PC-SIG Disk# 1059)

■ *DataPlot*

Here's a useful two-dimensional plotting system for scientific and engineering data which is powerful enough to produce publication-quality graphs.

Capabilities include menu-driven operation; a full-function setup editor; support for a variety of graph types, axis styles, and plot styles; a save-to-disk capability; linear, and single-cycle/multiple-cycle log plots; several plot styles; up to 10 curves in a single graph; and support for most common graphic adapters and HPGL-compatible plotters.

(PC-SIG Disk# 1059)

Special Requirements: *HPGL compatible plotter and CGA, EGA, or Hercules graphics.*

Author Registration: *$68.00*

■ *Select-A-College*

SELECT-A-COLLEGE sorts through over 1000 accredited two-year and four-year colleges and universities based on criteria you select, and tells you the 25 schools that come closest to meeting your requirements. Factors you can select include: major field of study or degree, specific courses, maximum tuition, maximum room and board costs, desired geography, Master's or undergrad programs, and more.

Processing takes around six minutes, and can save you hours of research. Includes an automatic letter-writing feature for contacting the schools to request further information and application materials. Surprisingly, some of the best-rated schools in the nation have some of the lowest tuitions. Good news for parents!

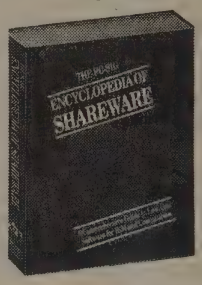
(PC-SIG Disk# 1345)

Special Requirements: *None.*

Author Registration: *None.*

The PC-SIG Encyclopedia of Shareware

$17.95 ($21.95 postpaid) from PC-SIG, 1030D E. Duane Avenue, Sunnyvale, CA 94086; 408/730-9291 (or Whole Earth Access).



Public (Software) Library

I have found that PC-SIG's programs (see above review) are several generations older than the current version available. I also tried an Appalachian Mountain firm. Their programs cost more than PC-SIG programs and were even older.

Then magician Bill Palmer in Houston introduced me to the Public (Software) Library (PsL). This Houston-based outfit is run by Nelson Ford and provides an extravagant service. Their newsletter is mailed out to arrive the first week of each month. In addition to new programs, "Bug Reports" are included in these pages. Recently they have added commercial programs at substantial savings. A complete review file of all the 1,700+ programs can be found on a set of floppy disks. If you register a program, you receive a credit of one free disk of your choice. If you obtain a program to test and a newer version is issued within two months of your copy, a free upgrade is given to you by returning the old copy.

—Craige M. Snader, Jr.

Demon 2.0 — Graphics: Display

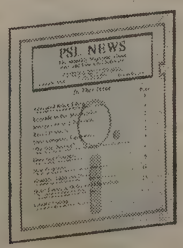
Copyright 1989 Bert Katzung; $0

is a cellular automaton, similar to Life. It displays a graphic grid of cells that change state with each "life cycle". As described in the August issue of Scientific American, the automaton starts out in a completely random state and gradually takes on a greater and greater degree of organization. Requires EGA or VGA. C source code is included. (Point of interest: This set of files shows the value of PsL's archiving files - the original files total over 200k, but they compress down to only 29k.)

MailList 3.7 — Mailing List Programs

#1476 — Copyright 1989 R. K. West Consulting; $29

is an easy to use mailing list management program that will print labels, create WordPerfect merge files, auto-index, and add descriptions. Changes in this version include and improved menu layout, better support for floppy disk systems (although it is still recommended to use a hard disk), improved record-finding system, new fields for Country and Fax number, user control of label contents, and program default settings.



PsL News

$18/year (12 issues) from the Public (Software) Library, P. O. Box 35705, Houston, TX 77235-5705; 800/242-4775.

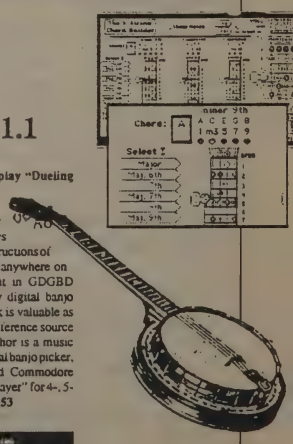
maxStax+

A source for homegrown, professional-quality HyperCard stacks. Prices tend to be higher than those of Heizer Software, the other main source of homegrown stacks, but macStax+ is a place where you'll find, alongside the functional productivity stuff, the slightly more esoteric: Watch Archive (you collect timepieces, don't you?), Banjo & Chord Scale Builder (see and hear chords and scales on the five-string), Salt of the Earth (graphics of 19th-century farm tools), ad infinitum.

—Richard Schauffler

maxStax+

Catalog **free** from maxStax+, 1142 W. Indian School Road, Phoenix, AZ 85013; 800/544-0577.



Daisy-Chain Conference Calls

BY TED BOOTH

When I first heard about three-way calling, available on ordinary phones, I saw the possibility of hooking up an unlimited number of phones into an unbroken daisy chain. Every phone participating has to have three-way calling. The phones are linked so that two of the three channels bridge each side of the chain. Actually, the phones at the very end of the chain do not need to have three-way calling.

I finally put this idea into action a couple of years ago with an organization I was part of that had sites in NY, PA, FL, and CA. We had many chain conference calls. A call can start at any node of the chain and spread outward from there. The phone with the lowest rates (such as evening rates) determined what node would initiate a call.

If one of the interior links is lost, one of the two chains that survive has to die (everybody hangs up) and the remaining chain then grows until the original chain is re-created. You can periodically do a roll call starting at the ends of the chain. If they answer, then everyone else is still connected. In practice, when the chain broke, someone near the end of the chain would call the main node on another line and then a roll call would be used to find the break. If only you could convert "call waiting" into a three-way call, then the chain could be mended with a single call! Until this is possible, large conferences are not practical using this method.

When I used it there were usually four or five sites participating in a conference. People sat around a high-tech speaker phone and passed around a microphone that was linked to the phone base via infrared.

That's all there is to it. It does require distributed intelligence — people who know how to use three-way calling and understand that they must hang up if their connection with the main node is lost. The calls can be managed by a person at the main node or the sequences of calls can be prearranged. ■

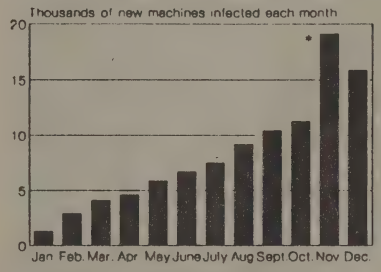
Critical Connections

Congress has done nothing comprehensive about national telecommunication policies since the Communications Act of 1934. Three years ago, I joined an intriguingly eclectic panel of experts who were invited to advise the U.S. Congress Office of Technology Assessment. The OTA, known for its no-nonsense, leading-edge assessments of new technologies and social implications, was planning a comprehensive look at the future of communications in this country. As part of my role in the panel, I hosted a computer conference on the WELL, inviting the online braintrust of software wizards, networking evangelists, librarians, entrepreneurs, futurists, educators, and kibitzers to augment my own knowledge of the different facets of telecommunication policy. When I attended the first meeting of the panel, six weeks after opening the Info conference on the WELL, I brought 300 pages of advice with me, which I had cut down from the more than 500 pages of conversation generated in those six weeks.

Two and a half years later, the report is out, and it's a stunner. It's an activist document, laying out a series of options for potential Congressional action. The impact of ***Whole Earth Review*** *and the WELL are evident, from the bold-faced quote from Stewart Brand's* ***Media Lab*** *on the first page to the section on "virtual communities" referenced to the* ***WER*** *article of the same name, and a paragraph about the WELL. In response to requests from the people who were still actively participating in the Info conference three years after it started, I called the OTA assistant director and asked whether it would be possible for them to make the document available in electronic form. Three days later, I got the disks in the mail. A cadre of online volunteers is working on finding host sites on the Internet, converting the report into HyperCard format, distributing the report through bulletin boards and users' groups. We hope to demonstrate by example that it is worth the government's effort to make important public policy documents, particularly those related to new communication technologies, available through the new communication media the documents purport to study.*

—Howard Rheingold

Figure 10-3—1988 Increase in Computer Devices Infected by Viruses



*Includes the Internet infection

■

The telephone book is the most frequently used reference source — 21 percent of the population consult it on an average day.

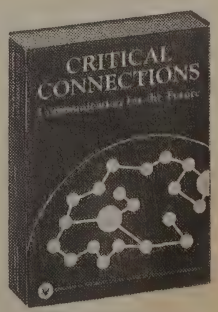
As another example of the importance of awareness: when a cable TV experiment went awry in southern Maine last year, a university extension course on firefighting intended for local firehouses was piped instead into all local residences. The next day, the university was flooded with requests to take the course, and enrollment tripled.

●

Researchers have found that subscribers to older cable systems that have two dials (one for the cable and one for the broadcast channels) generally tend to concentrate their viewing on the channels on either one or the other.

■

Option A: Create a new legislative mandate for promoting the Nation's communication infrastructure that both updates the Nation's communication policy and clearly designates responsibility for implementing them.



Critical Connections
GPO Stock #052-003-01143-3
1990; 395 pp.

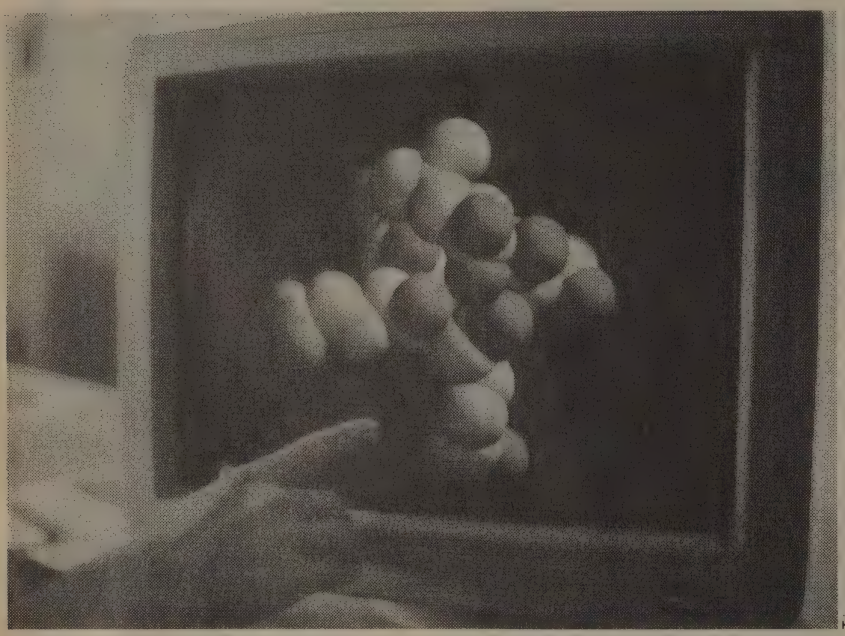
$17 postpaid from Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325; 202/783-3238.

If you notify your congressperson, he/she can supply you with a free copy of this publication. An electronic version of the report is available on the WELL.

CRITIQUE OF NANOTECHNOLOGY: A DEBATE IN FOUR PARTS

1. Chemistry says it can't happen.

BY SIMSON GARFINKEL



Tripos

One nanotechnology tool is molecular modeling software, such as SYBYL, shown here. The program represents not only the 3D image of atoms but also their surrounding force fields. Images of atoms brought together will behave like real atoms, binding or repelling in a correspondingly "atomic" way. Simulated chemistry such as this is now being used to design pharmaceuticals, in order to build drugs "rationally," atom by atom, much as nanotechnology forecasts.

Nanotechnology is a new engineering skill which promises great power by manipulating matter at the atom level (see WER *#54, p. 8). To date, the debate over its consequences (solution or problem!) have assumed its inevitability. Critiques of the proposed science — can it actually be done! — have been nonexistent in the public discourse. The following critique of nanotechnology doesn't address all the questions this technology brings up, but what a relief to have any technical challenge. Simson Garfinkel, a reporter for the* Christian Science Monitor, *has a master's degree in science journalism from Columbia and graduated with a triple major in chemistry, political science, and history of technology at MIT. He starts off this four-part debate by challenging the underlying technical details this new power is based on. Eric Drexler, Visiting Scholar at Stanford University and a key visionary of nanotechnology, offers his rebuttal. Garfinkel responds, and Drexler counters. Lastly, Steven Levy, author of* Hackers, *reports on the first conference dedicated to the issues raised here.*

—Kevin Kelly

THE WORD "nanotechnology" means very different things to different people. While most would agree that Nanotechnology is technology performed on the scale of nanometers — one nanometer being about the size of four zinc atoms laid side-by-side — that is where the agreement often ends.

To Howard Craighead, director of the National Nanofabrication Facility at Cornell University, Nanotechnology is a science that uses the chip-making techniques of the microelectronics revolution to produce devices of increasingly smaller dimensions.

To Rick L. Danheiser, a professor of chemistry at the Massachusetts Institute of Technology, Nanotechnology is a word that describes synthetic organic chemistry — a science which seeks to place atoms in precise and complex arrangements in order to accomplish exacting goals.

To K. Eric Drexler, an author and visiting scholar in the Computer Science department at Stanford University, Nanotechnology describes a technology of the future — a technology based upon self-replicating microscopic robots controlled by tiny mechanical computers, capable of manipulating matter atom by atom.

Who is right? Everybody and nobody, really, because "nanotechnology" isn't a scientific term. Nanotechnology is a mind set, an ideology, a way of solving big problems by thinking small — thinking very small.

My first exposure to Nanotechnology was several years ago when I was a student at MIT. A new student activity was forming called the Nanotechnology Study Group, a band of individuals committed to exploring the technology and implications of "Nanotechnology."

The Study Group's handouts were drawings of atoms arranged into nanometer-sized gears and bearings, as well as arrangements of atoms that were supposed to be memory circuits and logic building blocks for nanometer-scale computers. But the people in the Study Group weren't chemists and physicists: they were computer scientists. The questions that the Study Group was interested in exploring were not "will these particular drawings of nanodevices work?" — it was taken for granted that if these didn't, others would — but rather, what would be the uses and implications of such robots to medicine, science, industry and warfare; what would happen if an army of

nanorobots got out of control; and what would be their long-term impact on society. The people of the Nanotechnology Study Group were the forerunners to today's cult of Nanotechnology.

The basic tool of the Nanotechnologist is the "assembler," according to *Engines of Creation*, the book by K. Eric Drexler that reads like the Nanotechnologist Manifesto. No larger than a few hundred atoms across, assemblers would be constructed from gears that use single atoms for teeth and turn on frictionless pivots made from single chemical bonds. These nanomachines would come equipped with a computer and a robotic arm, and have the remarkable ability to construct ("assemble") materials or molecule-sized devices a single atom at a time. Assemblers would reproduce by building exact copies of themselves — thus it would only be necessary to build a single assembler, and this first assembler would build the rest.

Although it would be slow for a single assembler to construct anything larger than a fly speck, billions of assemblers working together could do almost anything. You could set a fleet of them about the task of covering your car's paint job with a micron-thin coating of diamond, constructed an atom at a time by assemblers using carbon from carbon dioxide plucked from the surrounding air: forget about rust and car washes. Assemblers could restore the ecological balance of the planet by making more ozone in the upper atmosphere. They could clean up oil spills by eating up the oil, or alternatively they could make oil from air and seawater. In wartime, assemblers would be the ultimate weapon, programmed to be "'omnivores" and rip apart attacking armies atom by atom.

There is certainly evidence that such manipulations at the atomic level are possible. Every cell of every living thing is constantly manufacturing, using and destroying tremendous numbers of relatively simple nanomachines called proteins. Some of them are structural, some of them perform chemical reactions, and some of them transmit messages. But proteins are almost always single-purpose devices which require nearly all of the machinery of the cell to produce and regulate them. No protein does all of the things that an assembler would supposedly be able to do.

One of the most intriguing of the proposed nanomachines is the nanosub, a device a little smaller than a red blood cell which could swim through a person's circulatory system in search of plaque or fatty deposits. Whenever the sub bumped into something that doesn't belong, it would switch on a powerful set of drills and shred the offending blockage. With a few robot arms, the sub could even repair damage. Sort of a nano-Fantastic Voyage, the concept of this sub has appeared in prestigious newspapers like *The New York Times* and *The Wall Street Journal*, as well as magazines such as *Scientific American*. The sub represents the best of what Nanotechnology has to offer: the ability to make our lives better.

The Cult of Nanotechnology paints a future in which technology has grown unimaginably more powerful than it is today. As a much bigger lever than any technology before it, they argue, it would do us well to think about the potential of the technology before the revolution happens: this is what they are doing. The problem with these people's ideas is that they envision working with atoms the same way a model-

Scientific American

A visualization of a nanomachine swimming through a capillary blood vessel, chewing away a fat deposit, lower left. Glucose and oxygen in the blood power two tiny screw propellers. The nanobot randomly wanders through the capillaries, programmed to eat only fat. One can easily imagine both the advantages and problems of such a device.

maker might work with wooden sticks and styrofoam balls — breaking a bond here, moving an atom to the other side, and forming a new bond. It is that conceptual model which is at the heart of all the Nanotechnologists' drawings of gears, motors and nanocomputer parts, as well as the very idea of the assembler's robot arm and the nanosub's drill. But atoms don't work that way.

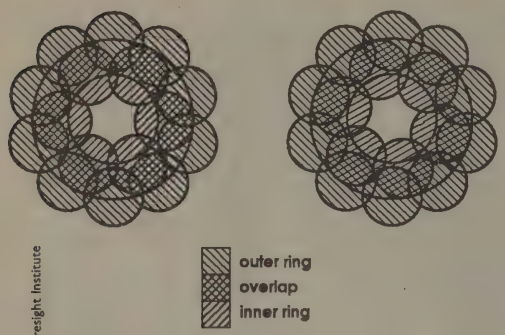
"[Drexler] discusses these molecular systems as mechanical systems," says Robert J. Silby, a professor of chemistry at MIT. "He bangs them and they go." The problem is, Dr. Silby explains, "molecules are not rigid — they vibrate, they have bending motions."

Even cross-linked or interlocked networks of carbon atoms exhibit these characteristics, Silby explains. "Therefore these will not act, mechanically, in the way he has written down. There is more to it than he has said."

Take the example of the assembler's "'robot arm." Such an arm could probably pick up a single atom,

since lone atoms are very reactive and likely to stick to anything that they come into contact with. Getting the atom off the arm, on the other hand, would require a lot of energy — quite possibly more energy than the nanomachine would have available.

The robot arm might have a little more luck working with groups of atoms, called molecular fragments. The energy required to work with molecular fragments is much lower than the energy needed to work with single atoms — this is the reason that proteins almost always work with molecular fragments. The only ways that a robot arm could hold a molecular fragment in place would be by making a chemical bond to it or by clamping the fragment in place with some sort of molecular cage.



Foresight Institute

An idealized van der Waals bearing, a key component in nanomachines. The molecular structure is similar to the "bearing" in certain bacteria, allowing its flagellum to spin (see illustration, p. 111). Artificial nanobearings have not been built yet, although organic ones are built by the most primitive life forms.

There are plenty of proteins that move molecular fragments around by using chemical bonds. But it is always the case that the proteins can form these bonds only with one or two specific fragments. It is doubtful that an arm could be designed to bond with any arbitrary piece of an arbitrary molecule.

Molecular cages do occur in nature, but they tend to be bulky and unwieldy. While there are some proteins which hold molecules in their active sites with flaps constructed from chains of amino acids, such active sites are always at the heart of the protein — not on flexible arms which can easily be maneuvered around. And, as with molecular bonds, the cages and the molecular fragments they hold always come in matched sets.

Presuming an "arm" could be constructed, it would need some sort of "eye" to locate molecular fragments that it would reach out and grab. What sort of sensors would the nanocomputer at the heart of the assembler use to locate the fragments in the first place? What would such a sensor be based on? Visible light has a wavelength fifty to a hundred times the size of a molecule. Light does not "bounce off" a molecule but more often goes straight through, only causing slight disturbances in the very outermost electrons of the molecule's atoms.

Light that has atomic-sized wavelengths is known as X-rays. However, even if the nanomachines could not generate enough energy to emit an X-ray without breaking apart, there is no way that they could detect the reflected rays or collimate them into recognizable images. Perhaps the nanomachine will use electrons or some other sub-atomic particle as a kind of atomic "radar," but there seems no way that a nanomachine could generate a predictable stream of such particles or interpret their reflections.

Nature gets around the imaging problem by relying on molecular diffusion and randomness to bring molecules to the places where chemical reactions can take place. As a protein comes into contact with a target molecule, thermal noise and motion cause molecules to explore trillions of positions and orientations every second. But Drexler and other Nanotechnologists maintain that nanomachines will not rely on diffusion because it is not precise enough for their purposes. Unfortunately, it is all that you have at the atomic level: even the biological process of active transport which moves molecules across membranes relies upon diffusion and random motion to get the molecules into the molecular pumps.

The idea of a universal assembler is somehow a very comforting one: a programmable machine, capable of manipulating atoms and carrying out reactions the way that a blacksmith might repair a horseshoe with anvil and fire, is an easier image than proteins or inorganic catalysts carrying out complicated chemical reactions by transferring electrons from atom to atom. And indeed, in the beginning of his book, Drexler describes an assembler grasping "a large molecule (the work piece) while bringing a small molecule up against it in just the right place. Like an enzyme, it will then bond the molecules together."

The idea of using a few well-crafted machines to make billions, and then using a billion machines to solve the world's problems is really an appealing one. It is especially appealing to a generation of computer scientists that has been raised on ideas such as recursion (a way of solving a problem with a function that refers to itself) and massive parallelism (an approach that uses thousands or millions of simple computers, all working together in unison to solve different chunks of complicated problems in seconds, instead of the days that a conventional computer might take.) Nanotechnology is the physical embodiment of these mathematical ideas. It is no accident that Nanotechnology's loudest spokesmen have been computer scientists, rather than chemists and biologists and materials scientists — people who have experience at moving atoms around on the nanoscale.

An assembler would necessarily be far more complicated than anything that has been built by nature on the atomic scale. This isn't an argument that such

constructions aren't possible: a lap-top computer is another good example of something more complicated than nature can build. But natural or not, assemblers would have to exist in the same environment as the biological molecules that they would be designed to operate on.

At MIT, professor of chemistry Rick L. Danheiser says that just because some advocates of Nanotechnology haven't had a training in chemistry doesn't mean that their ideas shouldn't be taken seriously.

"I see some anti-aromatic structures that can't possibly exist," Danheiser says, referring to the designs that Drexler has proposed for the "rod-based logic" of a nanocomputer. "It's unfortunate that he draws something that doesn't look so good, because a lot of people see it and discredit the whole thing."

Nevertheless, Danheiser says, "I think that they are doing a great service. Students in high school are reading *Omni*, thinking 'that's really neat.' "

Indeed, what the advocates of Nanotechnology are doing, Danheiser says, is "putting a lot of glamor into chemistry. Chemistry suffers compared to physics and biology. . . . That's why I hesitate to do anything to puncture their balloon."

What upsets Danheiser is some of the descriptions of chemistry that are used by advocates of Nanotechnology — a description, he says, that seems based on a freshman chemistry course's understanding of the field. One common analogy used by Drexler, for example, is that chemists throw bolts and nuts into a bag, shake it, and hope for a machine to come together.

"That's not an accurate picture of what one does in organic synthesis," says Danheiser. "We take nuts and bolts that are cleverly machined so that they self-assemble in a specific manner."

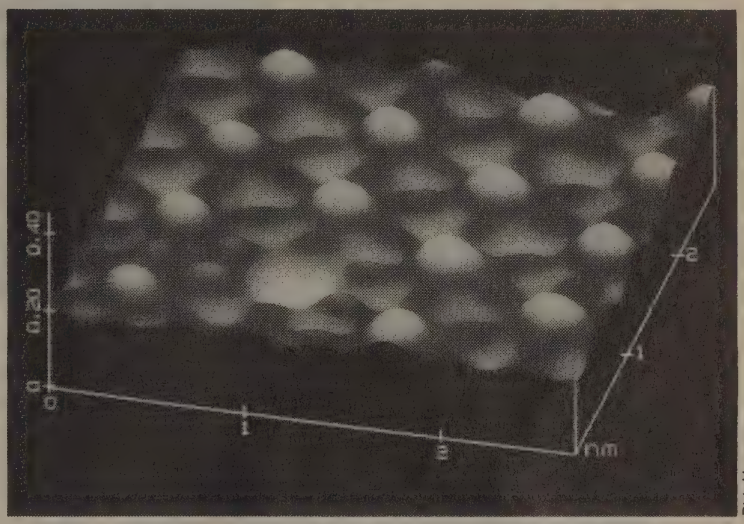
James S. Nowick, who is completing a doctorate in organic chemistry at MIT and plans to work in the field of molecular devices, puts it this way: "My main criticism of Nanotechnology, or more in particular, of Drexler, is that he's coming forth as being sort of a visionary without actually doing anything. . . . Whatever he is putting forth as science has to be tempered by the fact that we are dealing with somebody who is basically making predictions. . . . In my field, for instance, if you have a prediction of how something will work you can't just go publish that. You really have to have scientific results.

"I think that there are some problems and unreasonable aspects of some of the structures that Drexler has drawn. However," Nowick says, "I see them essentially as a sketch that one might give an architect."

The most important developments in modern chemistry, Danheiser says, is by "very, very serious chemists who are actually involved in molecules that have complex function. This is rudimentary nanotechnology, although I don't think that they would call it that."

For example, the 1987 Nobel Prize in chemistry was awarded to three scientists who had done pioneering work in the field of molecular recognition — which in a way can be thought of as "robot arms" that are pre-programmed to "pick up" specific molecules.

Danheiser is also enchanted by the idea of a nano-



A scanning tunneling microscope no bigger than a high-school microscope produces portraits of atoms. This image made by the Nanoscope II shows iodine atoms absorbed on the surface of a platinum crystal (notice the missing atom). Being able to detect matter at the atom level is one step in learning to control the location of atoms.

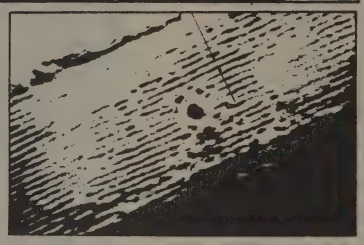
submarine that swims around a person's circulatory system, looking for cancerous cells to destroy. But Danheiser describes the sub as a large molecule with an artificial antibody on the front, grafted to a molecule of snake venom — a molecule which nature has given the capacity to cut up and destroy cells.

Such a machine, Danheiser stresses, wouldn't have to self-reproduce or even self-repair to be a medical success. The machine could be made synthetically, in a laboratory, and it could be "reprogrammed" by chemically removing one antibody and replacing it with another one.

"Chemists are getting the short end of the stick," says Nowick. "The best thing that chemists can do is get one or more spokespeople who are willing to beat the drum for the public, saying that 'this is chemistry, this is exciting technology, you should be interested in it, young people should pursue careers in it, and congressmen should provide more funding.' " □►

2.
Under special conditions, chemistry *can* build stable nanostructures.

BY K. ERIC DREXLER



The world's smallest Christmas card — only five square micrometers, about a billion times smaller than usual — produced by drilling holes four nanometers across in a layer of aluminum fluoride crystal. If it were possible to write all the books in the Library of Congress at this nano-scale, you could fit them onto the head of a pin, and still have room for all the volumes in the rest of the major libraries of the world. The holes (below) are "drilled" by dislocating atoms using a beam of electrons. Storing information by nanotechnology may be its most probable first use.

I HAVE BEEN ASKED to reply to the preceding critique and have done so in a hypertext style [to refer to Simson Garfinkel's comments]; *Whole Earth Review* plans to give Mr. Garfinkel another ability that hypertext will provide more widely — the ability to respond to a response.

1. What is nanotechnology?

Simson Garfinkel says that Howard Craighead defines nanotechnology as advanced microtechnology, while Rick L. Danheiser defines it as synthetic organic chemistry. As this shows, these fields already have names. So far as I can tell, it was I who introduced the term "nanotechnology" into general use, and as Mr. Garfinkel's paragraph on my usage suggests, there is no commonly accepted alternative name for the capabilities that "nanotechnology" is generally taken to describe. If this technology is important, then it needs to be discussed and it needs a brief, unambiguous name. Sticking with the original meaning of "nanotechnology" would be useful for this reason. (There is no perfectly clear line between synthetic organic chemistry and nanotechnology, but neither is there a perfectly clear line between night and day; they are distinct, though one leads to the next.)

2. Why are computer scientists prevalent among those interested in nanotechnology?

Chemists and physicists are best placed to critique proposals in nanotechnology, but their orientation is that of scientists, not of engineers. The tend to focus on what can be studied today, not on what can be built tomorrow. Computer scientists (despite their name) are, in this sense, engineers. Further, they recognize the value of tiny, fast, controllable things, and they are habituated to technological revolution.

3. What are we to make of the excitement caused by the concept of nanotechnology?

I believe Marx once said, "I am not a Marxist." I may be forced to echo this remark. The basic concepts of nanotechnology are technical and open to technical criticism. If they are true, then they have enormous consequences, and it is natural for people to become excited and for some to become starry-eyed. It would be an *ad hominem* fallacy, however, to judge the validity of technical concepts by emotional characteristics of the response they raise. Still, it is a good rule of thumb to be especially skeptical of ideas that people seem to want to believe; accordingly, in my technical talks I urge my audiences "to be harshly critical of any ideas they hear labeled 'nanotechnology', starting with my own."

4. Can gears turn on frictionless pivots made from single chemical bonds?

All pivots (or bearings) have some sliding friction, or *drag*, though they can be made to have a negligible amount of static friction, or *stickiness*. Single chemical bonds are too weak and elastic to use as bearings for the gears mentioned here, but there are other, more adequate approaches based on sliding surfaces. Like many of the points that follow, this was discussed in my course at Stanford, "Nanotechnology and Exploratory Engineering."

5. Will assemblers build devices a single atom at a time?

In general, probably not, though I have sometimes used language that may suggest literal atom-by-atom construction. A more accurate statement would be something like "Assemblers will maneuver reactive chemical moeties to tenth-nanometer precision, effecting a series of elementary chemical reactions, each of which adds one or several atoms to a workpiece, giving precise control of the resulting molecular structure." And even this is a simplification, since a typical

operation will often do something a bit more complex, such as adding three atoms while removing one. The shorter description gives a clear picture of the net effect.

6. Will assemblers do all these things?
Not directly. Assemblers will be general-purpose manufacturing machines, able to make almost anything so long as they are given the right raw materials, fuels, operating conditions, and instructions. They will be used to make many special-purpose machines, and the latter will do most of the work. To make a particular product in quantity, it will make no sense to use general-purpose assemblers; these will instead be used to build a special-purpose production line, like an engine fabrication line in Detroit. These production lines will then be used to turn out devices like Simson Garfinkel's hypothetical diamond-coating-appliers (perhaps formulated into a rub-on paste?), or the more desperately needed devices able to clean up the mess made by 20th-century industrial technology.

Weapons are among the potential products we need to worry about, but ripping attacking armies apart atom by atom is rather too crude and too dramatic; one suspects that the military mind will find other applications for a manufacturing technology characterized by the construction of precise and sophisticated devices. In general, having an image of assemblers doing everything in the future would be a bit like having an image of lathes and milling machines doing everything today.

7. What does nanotechnology assume about how atoms and molecules work?
Gears, motors, mechanical nanocomputer parts, and Simson Garfinkel's proposed drill would work in an essentially mechanical fashion, as would the positioning operations of assembler arms (resembling those of industrial robot arms). The actual chemical transformations effected by assemblers, however, have little resemblance to familiar mechanical operations. Note that describing molecular motions in mechanical terms (e.g., in the field of molecular mechanics) is a standard part of chemistry.

8. What about elasticity and vibrations?
Every physical object is a collection of atoms; nanomachines will simply be very small physical objects. Everything vibrates, everything bends, and machines work regardless; the differences here are more quantitative than qualitative. On a very small scale, the vibrations associated with heat itself become of tremendous importance, and are a crucial issue in nanomachine design and operation. I mention this issue in *Engines of Creation*, and have done quantitative analyses of thermal vibrations in both logic systems for mechanical nanocomputers and in assembler arms. There is a lag in publication and distribution of information in new, interdisciplinary fields, though, so it would be surprising if these results were universally known in the MIT chemistry department.

9. What about problems with picking up and placing lone atoms?
See (5).

10. Need an arm bond with any arbitrary piece of an arbitrary molecule?
Assembler arms will wield a variety of tools, each with a standard "handle" fitting a standard "hand"; the tools themselves will be specialized. Further, only a limited range of tools would be needed to build a wide variety of products, since even a complex product can be built through a complex series of simple operations. All this is familiar from macroscopic manufacturing technology.

11. Will nanomachines use x-ray or electron-beam "radar" to spot molecules?
Surely not, for reasons well-stated here (I have not seen this proposed elsewhere). Further, freely moving molecules would elude grabbing even if they could be seen; assembler arms would simply be too slow. Industrial robots typically pick pre-positioned, pre-oriented parts off something like a conveyor belt, rather than rummaging around in a bin — and this despite the greater ease of vision on a macroscopic scale. I expect that assemblers will work in a similar fashion.

12. Will nanomachines rely on diffusion?
There is a distinction to be drawn between relying on diffusion *somewhere*, and relying on it *everywhere*. Assemblers will enable precise construction of large, complex molecular systems because they (i.e., their positioning arms) will be able to direct chemical reactions with a specificity and reliability that cannot be achieved when molecules are free to bump together in all possible positions and orientations. Thus, they avoid diffusion when moving molecules to the site of reaction. General-purpose assemblers are expected to pluck tools incorporating reactive molecules off conveyor belts which have been loaded with activated tools by special-purpose systems of somewhat enzyme-like machinery, which in turn have gotten their raw materials from the surrounding solution. This earliest step will involve the transfer of molecules — by diffusion — from that solution to selective binding sites like those familiar in proteins and supramolecular chemistry.

13. How complicated are assemblers?
Assemblers and nanocomputers will be roughly as complex as industrial robots and microcomputers, because they will contain similar numbers of parts performing similar functions. All these devices, however, will be far less complex (and adaptable) than living organisms; they will have broader capabilities in some respects, but not in all.

14. Can these anti-aromatic structures exist?
For quantum-mechanical reasons, some molecules that can be drawn as rings with alternating double and single bonds are especially stable (like the six-membered benzene ring) and others are especially unstable (like the four-membered cyclobutadiene

ring). One of my nanomechanical designs contains a ring resembling the latter; it has the advantage of having a useful shape for the purpose. Is its "instability" a problem?

Chemists regard chemicals as unstable when (for example) they spontaneously dissociate, or rearrange, or react with themselves at a high rate, or when they readily react with a variety of other molecules. This final process is not intrinsic to the molecule, but results from the presence of other reactive molecules. In a different environment, the molecule will be stable. Chemists ordinarily work with molecules in solution, and in vast numbers; these molecules are free to encounter others of the same kind, so any reactions that occur will be unavoidable. This is a stronger kind of instability, typically dealt with by studying molecules under low-density, near-vacuum conditions, or in solid matrices of noble gases at temperatures near absolute zero.

Under the latter conditions, cyclobutadiene exists, but it begins reacting with itself on even slight warming (to 25 degrees Kelvin). In a nanomachine, of course, molecules do not wander freely; they encounter only certain other structures in certain orientations. Under these conditions, the cyclobutadiene ring can indeed be stable (as it is at room temperature when surrounded by bulky, branched side-chains). A call to Rick L. Danheiser confirmed that he shares this view of stability and its application to the case at hand; I had run these structures by another organic chemist for criticism before publishing them. Only instability in the sense of a molecule falling apart or rearranging spontaneously can be used to criticize a structure out of context (and even then a suitable molecular environment can create exceptions, left as an exercise for the nanotechnologically inclined chemist).

15. What about these freshman-chemistry-course analogies?

They are intended to inform readers with diverse backgrounds, sometimes lacking even freshman chemistry itself. They are useful in the same way that Danheiser's reference to "machined" molecules is useful — as metaphors to convey a qualitative understanding of some aspect of the subject matter, such as the ability of synthetic organic chemists to make a wide range of moderately complex structures with precision. (For perspective: in chemical synthesis, a hundred-atom structure is considered large and complex but an assembler arm will likely have on the order of a *million*).

16. Should one talk about what has not been demonstrated?

James S. Nowick is correct that predictions are not publishable in many fields of science. However, nanotechnology is not a branch of science (as I have taken pains to point out in *Engines of Creation*); it is an engineering discipline based on established science. Engineering projects are often discussed and written about before they are undertaken.

Indeed, in the 1930s members of the British Interplanetary Society performed feasibility studies which argued that one could fly to the Moon with rockets. With care, feasibility studies can be done today in the field of nanotechnology. The required intellectual discipline includes strict avoidance of areas of scientific uncertainty (or pursuit of designs which are robust despite a given range of uncertainty); it is thus closer to engineering than it is to science. To scientists, engaged in learning new facts about nature, talk of future knowledge is speculative and often pointless. To engineers, engaged in building new devices, talk of future possibilities *grounded in established science* need not be speculative and is often essential.

The above is a fragmentary sketch of some issues in the methodology of exploratory engineering. A chapter-length exposition is available (see the closing note for further information).

If one can indeed understand something about future technologies, should we ask that *everyone* refrain from doing so (or at least from publishing the results) before these technologies are demonstrated? To do so would be to request that society turn a blind eye to a significant scrap of knowledge regarding our future. I believe that exploratory engineering deserves a genuinely tiny fraction of society's technical effort, and that its products, when they seem interesting, deserve rigorous criticism — or partial, carefully hedged approval, when merited — from those with competence in a relevant field.

17. Are we doing nanotechnology today?

The developments and goals cited here are relevant, and show how short-term objectives are leading toward steadily more sophisticated molecular devices. In my work I have focused on long-term developments, and have described devices that no one would consider trying to build today (because we lack the tools) and that no one is likely to build tomorrow (because we will then have better designs). Still, even the crude nanotechnology I am able to describe and defend would have capabilities far beyond what has been achieved today. We are speaking of the difference between a mousetrap on the floor and a gripper on an industrial robot arm backed up by a computer.

In closing . . .

I thank Simson Garfinkel for a stimulating critique of my work; it has provided an occasion to explain several points previously made only in teaching or in conference proceedings. A general observation seems in order, however, given a natural and widespread misunderstanding of my view and the it-would-be-nice-if tone of his essay: I have not *advocated* nanotechnology, I have advocated *understanding* it. Reporters, hearing me describe a technology that can accomplish many long-sought goals, often assume I must think that it is an unalloyed blessing, or at least a good thing — even when I emphasize its great potential for abuse (*Engines of Creation* has a chapter titled "Engines of Destruction"). My position seems just

a shade too subtle to fit a simple, stereotyped story: I believe that in our diverse, competitive world, basic human motivations make nanotechnology effectively inevitable, and that, in light of this, we need to understand its great potential for good and ill so that we can formulate and act in accord with effective policies.

Nanotechnoloy will, I believe, be the dominant manufacturing technology of the coming century, making possible a host of amazing products. What we build with it will make a vast difference to human life, the biosphere, and the future of the world. Ideas regarding nanotechnology need to be taken seriously, which means evaluating them with proper care and skepticism. □

3.
Molecules are too unstable to be controlled the way Nanotechnology needs.

by Garfinkel

A BIT OF BACKGROUND . . .

In January, I found myself in a lecture room in California, talking with Stewart Brand about the possibility of machines no larger than a wavelength of light. "I don't believe in Nanotechnology," I finally said, referring to the lectures and writings of K. Eric Drexler. It wasn't that I didn't believe that atoms couldn't be placed into precise arrangements, I explained. I simply didn't believe that the laws of physics and chemistry would ever allow the creation of machines as small, yet as complex, as Drexler's would necessarily have to be.

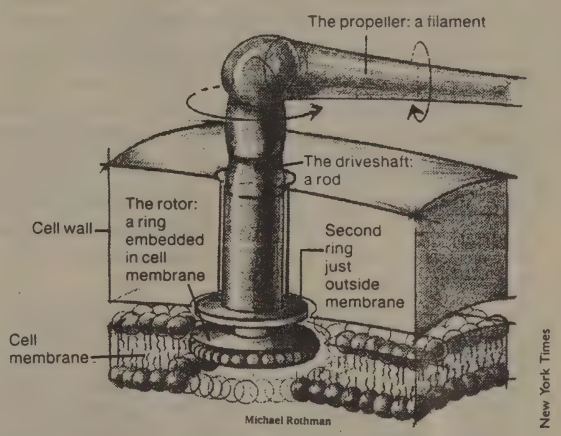
Brand invited me to write an article explaining my objections, so when I returned to Cambridge I started showing Drexler's papers to chemists and physicists whose opinions I respected. Many of them laughed, saying that Drexler's predictions were "'impossible." Others refused to comment, hoping to stay away from what they saw as science fiction masquerading as scientific controversy.

Making predictions is a tricky art, and Mr. Drexler, whose training is in computer science, not chemistry, is bound to misplace a bond here or there. But in formulating my disagreements with Drexler, I came to realize that many of his writings contain the seeds of possibility, if some of his words were translated and not taken at face value, and so my first article was born.

The heart of my continued disagreement with Mr. Drexler is summed up by the matter of capitalization: Drexler believes that the word "Nanotechnology" should not be capitalized, just as the words "biotechnology" and "'microtechnology" are not capitalized. But Nanotechnology is not like biotechnology or microtechnology: Both biotechnology and microtechnology exist: there are laboratories where work is done, journals where results are published, and physical devices which put these technologies to work.

Nanotechnology has none of these physical trappings; it is not yet an "engineering discipline," as Drexler maintains [16], because there is nothing that is being engineered in any conventional sense. This is why many scientists think Nanotechnology is science fiction. It isn't that "there is a lag in publication and distribution of information in new, interdisciplinary fields," as Drexler contends [8]. Indeed, an astounding number of people are familiar with his work.

Perhaps the word "nanotechnology" (the uncapitalized version) wasn't in wide use when Drexler started out, but it is now, and it is generally regarded by those in the microelectronic and microfabrication com-



Each propellor-like filament that propels a bacterium is driven by a motor under the bacterium's cell wall. The filament's drive (transferred through a 90-degree elbow "gear") is an electric motor turned by a chemically induced flow of protons. A similar design can be used to move nanomachines.

munities to mean lithography at the nanometer scale. "Nanotechnology" and "'nanotechnology" therefore mean different things to different people, and this is my reason for insisting on the capital-N. Names are important, because they are the place-markers that we use for ideas.

Science fiction — or, more appropriately, speculative fiction — serves many useful purposes. Drexler's predictions force one to think about the problems caused by chemistry, biotechnology and physics, and how to solve them. But to talk about Nanotechnology in such certain terms as Drexler does, always writing about what it "'will do," leaves a bad taste in the mouths of many scientists.

It isn't that chemists and physicists "tend to focus on what can be studied today, not on what can be built tomorrow," [2] as Drexler asserts. Scientists simply

tend to focus on what they think is allowed under the laws of chemistry and physics. Whether Drexler's Nanomachines follows these laws remains to be seen.

In Drexler's world of Nanotechnology, atoms do exactly what he wants them to do. Drexler's atomic bonds, for example, are extremely rigid — they have to be, so that his atom-sized gears will turn instead of simply having their teeth bent. Likewise, physical effects like diffusion seem to turn on or off as needs are dictated by Drexler's designs. Small reactive molecules, for example, never, ever slip into the Nanomachines and gum up the works. "In a nanomachine, of course, molecules do not wander freely; they encounter only certain other structures in certain orientations," Drexler writes [14]. How does a Nanomachine protect itself? How does it repair itself when it breaks?

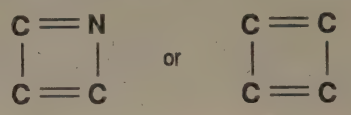
It all goes back to the very mechanistic view of atoms and bonds which most of Drexler's work is based on. While "describing molecular motions in mechanical terms is a standard part of chemistry," [7] chemists do not think about chemical reactions in such terms. The most important thing in chemistry is the movement of electronic charge, not the movement of atoms. Once electrons move, atoms rearrange themselves automatically, because at the atomic level electrostatic force is thousands of times stronger than mechanical force. Nevertheless, Drexler continues to write about atoms if they were so many wooden balls, pegs and springs.

To say, as Drexler does, that the arms of Assembler need not be able to bind to arbitrary molecules — instead, they wield tools that have this ability [10], is to restate the question, not answer it. How will a "limited range of tools" be used to "build a wide variety of products?"

"Macroscopic manufacturing technology," it turns out, is a very bad model for how to build things at the molecular level. I can lift a quarter from a table top with a tweezer, a pair of pliers, or even with two chopsticks. But biology teaches us that nearly every molecular fragment must be manipulated by a unique tool, a special-purpose protein designed specifically for the task. Other proteins simply don't work: they either can't pick up the particular molecular fragments (because the fragments don't fit properly and slip out due to vibrations), or they can't let go (because the fragments irreversibly bind to the tools.)

Likewise, if Assemblers do not need radar or vision because they pick "pre-positioned, pre-oriented parts off something like a conveyor belt," [11] the next logical questions to ask is "how do the parts get on the conveyor belt in the first place?" and "what pre-positioned and pre-oriented them?"

I was quite surprised that Drexler defended his published structures as stable. Although it is impossible to know with certainty whether or not a proposed molecule is stable without actually making it, there are many guidelines that chemists follow to assess stability. In general, four-member rings, such as:



are intrinsically unstable because they place carbon bonds at 90-degree angles, instead of the preferred tetrahedral angle of 109.5 degrees. Yet it is these instable structures that appear in Drexler's proposed "Probe knob structure" and "Gate knob structure," which are the basis of his mechanical Nanocomputer. If these structures begin to disintegrate at 25 degrees Kelvin [14], how will they last inside a Nanocomputer? Even if the computer were supercooled, the smallest amount of mechanical energy (perhaps a result of the computer's operation?) would be enough to set them off.

In my original article, I tried to stay clear from arguments about whether this or that arrangement of atoms would be stable or not, because such arguments cannot be productive. It is impossible to prove that something cannot exist. If by some chance I should convince Drexler that he made a mistake, all he would have to do is come up with some alternative arrangement of atoms and say, "Well, how about this one?"

I agree with Drexler that he has "described devices that no one would consider trying to build today (because we lack the tools) and that no one is likely to build tomorrow (because we will then have better designs)." [17] I think that he should include this statement as a footnote to every molecular structure he publishes.

Certainly we should talk and think about things that have not been demonstrated; such discourse is at the heart of all future discoveries. But if we claim that such discussions are scientific, then it is important to stay within the laws of established science. I have read philosophy and scholarly discussion about the possibility and implications of time travel, but I do not consider it a serious possibility, nor would I write an article on all the things that we could do "when time travel is a reality."

I wouldn't say that "since time travel is an interdisciplinary study, it is understandable that many people are not familiar with the means by which it will be achieved." Drexler has made many such statements about Nanotechnology, angering and alienating many scientists.

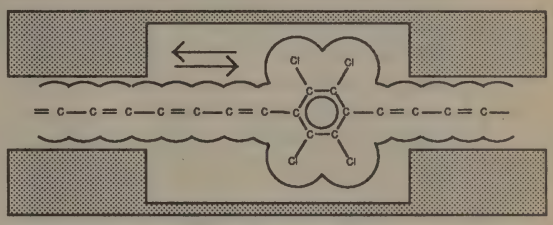
In closing, as a science writer whose first scientific training was in chemistry, I can only hope that Drexler's graphic descriptions of his world of Nanotechnology stimulate more popular interest in the chemical and biological sciences. I simply fear that he has been too cavalier in many of his descriptions, and that scientific possibility has often been pushed aside for sensationalism.

To say flat out that "I don't believe in Nanotechnol-

ogy" is probably a misnomer. I certainly believe that our ability to control the placement and arrangement of atoms will only get better as time goes on. A century from now, a student of history may discover Drexler's articles and, with some amusement, note the similarities between what Drexler predicted and what came to pass, just as I might read Charles Babbage's plans for a computer based upon a steam engine. But I think that the technology that future manufacturers use to arrange the placement of atoms will look a lot more like conventional chemistry and biology. And while this might be a "Nanotechnology" of a sort, it is a far cry from self-reproducing, self-repairing Nanomachines driven by tiny mechanical computers. □

4.
Natural materials prove that nanostructures can be built.

by Drexler



One part of a nanotechnology computing machine is suggested by this structure devised by Eric Drexler. It is an "alignment knob" which slides back and forth in a slot and aligns the arrays of mechanical components (all small atomic assemblages) so that they can "calculate" in the manner of mechanical adding machines.

I AM SOMEWHAT disappointed by the tone of Mr. Garfinkel's response to my response; much of it shifts away from his original, valuable focus on technical criticism to a focus on style, words, and feelings. These are important in their place, but are scarcely scientific or professional in the context of a technical debate. Some of his criticisms amount to a request that I repeat certain elementary points throughout my writings. This might inhibit misunderstandings, but it would also inhibit communication of anything new. If the term "nanotechnology" were widely used in the U.S. in the manner that Mr. Garfinkel suggests, I would expect a reasonable fraction of technical papers and news articles to use it that way; they don't.

His strongest criticism, if true, would be my proposing unstable four-membered rings and thus revealing a dramatic ignorance of chemistry. But these rings do not "disintegrate" at 25 degrees Kelvin, they *dimerize*, and this requires that two molecules encounter one another in an orientation which would be prevented by mechanical constraints in the nanocomputer. Again, and more clearly: I have discussed this matter with Prof. Danheiser, whom Mr. Garfinkel quotes against me, and he agrees with my view of the matter. Indeed, he stated that he had never heard me say anything that was inconsistent with today's chemical knowledge, though he noted that he had heard some serious distortions at second hand.

Mr. Garfinkel speaks of "many scientists," "an astounding number of people," (etc.) as being critical of my work, but who are they, and what are their *substantive* criticisms? In the case of Prof. Danheiser we were given a name and a direct, substantive quote; after a few minutes of discussion with him, the difficulty evaporated. I have yet to encounter a major technical criticism of the core concepts of nanotechnology that does not evaporate once it is examined. There seems to be a lot of smoke in the air, but no fire — perhaps the haze is fog?

A few notes: My training is not in computer science, as Mr. Garfinkel states, but in interdisciplinary science and engineering. Molecular diffusion is indeed controllable, being rapid in gases and liquids and effectively blocked by suitable solid walls. I trust this explains why I assume that it occurs in some places and not in others. Molecular mechanics is indeed not the whole story of chemistry — it gives a decent description of molecular vibrations and rotations, but not of chemical reactions. Single-atom gear teeth will indeed bend under load (why would anyone assume that I think otherwise?), but they will also turn the gear, given any sort of reasonable bearing. How will a limited range of tools build a wide variety of products? In much the same way that they do in synthetic organic chemistry, in living organisms, in home workshops, and in flexible manufacturing plants; ask J. Baldwin. Time travel is a straw man, and no friend of mine.

Regarding Mr. Garfinkel's last two sentences, amen! But I have been at some pains to distinguish my designs from "predictions"; they are intended only to show that devices having certain capabilities are physically possible, so that we can try to prepare for their emergence in the real world. I am glad that this intertwined collection of arguments and design concepts has persuaded Mr. Garfinkel that these prospects are real. ■

Readers in the U.S. can obtain copies of the essay "Exploratory Engineering," together with a *Britannica* reprint on nanotechnology, by sending a stamped, self-addressed large envelope with $1.25 postage to the Foresight Institute, P. O. Box 61058, Palo Alto, CA 94306. Outside the U.S., send $4 for airmail delivery.

MAXIMIZING THE UNDERSTANDING

Report on the first nanotechnology conference

BY STEVEN LEVY

Kevin Kelly

The first conference dedicated to exploring the technical issues of nanotechnology brought together biologists, physicists, material scientists, and computer miniaturists interested in controlling the very small.

ON THE WEEKEND preceding Halloween 1989, Stanford University and the Global Business Network co-sponsored the First Foresight Conference on Nanotechnology in Palo Alto, California. The explicit point of the conference was to assess and encourage "enabling technologies" that could eventually result in nanotechnology, or, as Eric Drexler puts it, "thorough control of the structure of matter." Implicit was a sense of history — if nanotechnology did happen in a century or two, the conference would be celebrated, perhaps elevated to a legend.

A self-selected group, this choir had already been converted to the nanotechnology vision, or at the least intrigued by its implications. Most everyone in attendance took for granted that the sorts of things Eric Drexler wrote about in *Engines of Creation* (the conference's unofficial Bible) were achievable, if not preordained.

In that sense, the conference could have used a Simson Garfinkel or two. Although there were skeptics, most notably Frederico Capasso of Bell Labs, who gently chided the nanotechnoids for equating the possible with the inevitable, no one delivered an outright broadside against the field. It's understandable why — you don't find Lee Atwater at ADA conclaves — but the atmosphere seemed conducive to an aggregate suspension of disbelief. There seemed a dissonance between some of the scientific presentations, which while often impressive seemed baby steps towards the moon-shot achievement of nanotechnology assemblers, and Eric Drexler's fully-fleshed vision, which almost all the participants had ingested. For instance, two Dupont scientists, Tracy Handel and Michael Ward, described work in protein engineering which, while impressive, was orders of magnitude away from building Drexler's envisioned molecular computers.

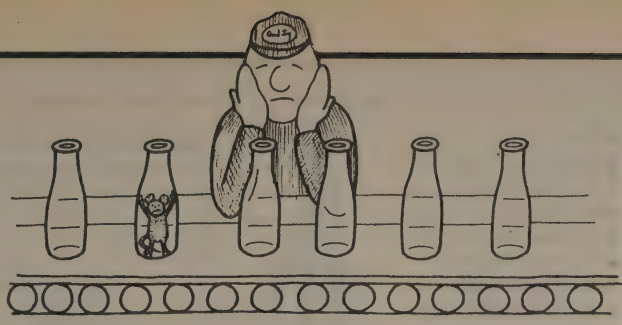
On the other hand, if you came to the conference wanting to believe in nanotechnology and weren't quite sure, there was plenty to push you over the edge. For me, the most vivid presentation was IBM Alamaden's John Foster, showing us slides his group made by using the Scanning Tunneling Microscope. With this instrument, he was able to actually deliver pictures of individual atoms. Watching these fuzzy yet discernible arrangements of those elemental components, I had a similar feeling to the recent experience of seeing a sonogram of my unborn child. There was something magical about it, also something voyeuristic — we're able to tamper with stuff that we previously couldn't get our grubby hands on.

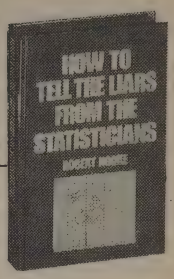
My own interest in nanotechnology hinges on my researches into artificial life. I see the possibility that the synthetic molecules of the future may be sufficiently independent to evolve, arguably becoming lifeforms in and of themselves. Drexler insists that this won't happen; his argument is that because it isn't in the interest of the human race for this to occur, and we will be able to do pretty much anything we want in the field without opening the Pandora's Box of evolution, scientists therefore will conscientiously prevent nanotechnology from heading in that direction. To me, this seems to contradict an assertion that Drexler himself cites as gospel in his book: If It Can Be Done, It Will Be Done.

This is not to say that nanotechnologists ignore the social implications of the realization of their vision. The most remarkable session of the First Foresight Nanotechnology Conference occurred on the final afternoon, when speakers addressed some of the possible dangers resulting from this technology. The discussion really didn't resolve anything — no one was about to put the brakes on interesting scientific work just because of some vague future dark side, and the speakers brushed aside any discussion of the military applications of nanotechnology. Still, it was laudable that the Foresight people set aside that much time for social and ethical matters. This is in keeping with Eric Drexler's stated agenda, one which Garfinkel doesn't quite grasp. As Drexler told the conference in his welcoming address, he considers his job as "maximizing the ratio of understanding" — to stimulate discussion of nanotechnology so society might deal with it intelligently if it does come.

On the other hand, considering Drexler as synonymous with nanotechnology is an easy error to commit. Through no fault of his own — people seemed to expect it — Drexler's ubiquity was a given at the conference. At times, considering his several appearances at the dais and the numerous testimonials tossed to him by various speakers, I felt I was attending Eric's bar mitzvah. Presumably when others emerge as leaders of the field — by virtue of achievement — this will change, and nanotechnology may be less susceptible to Garfinkel's charges of cultism. Until then, nanotechonolgy may be just talk, but some of the most provocative talk you can find these days. ■

How to Tell the Liars From the Statisticians





"Let's see the numbers" isn't enough. What you really mean is "Let's ***interpret*** *the numbers." That isn't always easy, particularly if it's been a few years since your last stat class. This book makes it easy to see through the crap, including your own; it is most embarrassing to be called out for tainted number manipulations, especially if you're trying to be good. We liked a book on the same subject a long time ago:* ***How to Lie With Statistics*** *(**EWEC** p. 25). This one is similar, but more up to date. Thankfully, the reading is easy. Amusing, even.*
—J. Baldwin

•

Let's take a utility company that wants to keep up with 10% inflation by raising its rates 10%. Suppose it has a million customers with an average monthly bill of $72. A business reporter can choose from these three headlines:

Utility Asks 1⁰ Rate Increase
Utility Seeks 10% Rate Hike
Utility Asks for $86.4 Million Increase

The first of these is based on the hourly rate, as is done when unions demand raises. The second is the reasonable way of describing the request. The third is an annual total and is calculated to encourage angry readership. It isn't necessary to point out which one of these three headlines is nearly always the chosen one.

•

When a screening procedure does fall short of perfection, the quality of the product cannot be guaranteed by the screening procedure alone. If a bottle inspector is able to detect 99% of the foreign objects in passing bottles, some people seem to think that this means that 99% of the bottles getting into the hands of consumers will be free of objects. To see that the inspector's error rate and the percent of defectives in the final output are only weakly related we have only to look at the two extreme cases. . . .

At one extreme we have a product that contains no defectives before it gets to the inspector. Obviously, it will still have none after passing by the inspector, even if the inspector is incompetent. At the other more interesting extreme, consider a product that is completely defective. If the inspector is perfect, nothing will get by and there will be no output. If he or she is merely almost perfect, a few will get by, but they will all be defective, so that even though the error rate may be very small, the output is 100% bad. For those whose mathematical limitations prevent them from grasping this thought, someone invented the picturesque phrase "garbage in — garbage out" which describes the situation very nicely.

•

A significant result tells us that enough cases were observed to provide reasonable assurance of a real effect. It does not necessarily mean, though, that the effect is big enough to be important.

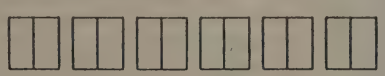
How to Tell the Liars From the Statisticians
Robert Hooke, 1983; 173 pp.
$35 ($35.50 postpaid) from Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016; 800/228-1160
(or Whole Earth Access).

Calculus By and For Young People

By young, he means seven years old! I don't know about ***you****, but when* ***I*** *was in high-school, I would have preferred cobra-kissing to a calculus exam. That's mainly because back then (I now know) textbooks were written "to challenge the student," which is not a good way to teach calculus or most anything else. So here is a book serving calculus to grade-school kids. Yeah, they seem to be smarter than we were at seven, but, as you guessed, I look at this book to see if it would have helped me when I needed help badly. It woulda, and it still would serve as a useful review. For calculus beginners of any age.* *—J. Baldwin*
[Suggested by Dave Grothe]

Calculus By and For Young People
Don Cohen, 1988; 177 pp.
$12 postpaid from Don Cohen, 809 Stratford Drive, Champaign, IL 61821; 217/356-4555
(or Whole Earth Access).

He couldn't share 6 cookies with 7 people, so he cut each in half, obtaining 12 half-pieces.



He shared these pieces; each person got $\frac{1}{2}$ of a cookie. He had 5 halves left, which he couldn't share with 7 people.

He cut these 5 pieces in half.
He now had 10 quarters

He shared these with the 7 people.
Each person now had $\frac{1}{2} + \frac{1}{4}$ of a cookie. There were 3 quarter-pieces left over, which he couldn't share with the 7 people.

He cut these 3 quarter-pieces in half, which resulted in his having 6 eighth-pieces.
But this was not enough to share with the 7 people.

Now each person still had $\frac{1}{2} + \frac{1}{4}$.
He cut the 6 eighth-pieces in half, obtaining 12 sixteenth-pieces.
Each person then shared one of these.

Now each person had $\frac{1}{2} + \frac{1}{4} + \frac{1}{16}$ of a cookie and he said he could go on (and get lots of crumbs).
There is a pattern; each person gets:

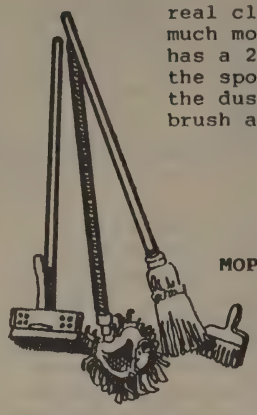
$\frac{1}{2} + \frac{1}{4} + \frac{0}{8} + \frac{1}{16} + \frac{1}{32} + \frac{0}{64} + \ldots$ of a cookie!

And we have an infinite series!

Brad did something I had never seen before. Looking at things in a new way, seeing new connections to other things, that is a powerful idea. You're not just learning one thing, but learning how to learn new things. Since this happening, other ways of equal interest were invented by other people; Brad's way just happened to end up as an infinite series.

Michael Olaf

*An even better Montessori-based home-schooling catalog than we mentioned last time (**WER** #64, p. 123). These friendly folks have selected things that really do educate, rather than just dazzle and make a high profit. They carry some almost-forgotten classic self-education books that I have found unavailable elsewhere. And low-profit items like $4 picture-card sets (perfect, all you need) that the business manager at those slick "yuppie-kid, son of Sharper Image" catalogs of expensive playthings would not be caught dead selling. Instead, this tool collection is full of plain stuff, reliable stuff, wise stuff. I found their service fine.* —Kevin Kelly



MOPS AND BROOMS In our house, even the adults have stopped using the larger versions of these real cleaning tools! The small ones seem so much more accessible and fun. The straw broom has a 27" handle, the dust mop a 29" handle and the sponge mop a 28" handle. The mop head on the dust mop is removeable for washing. The brush and dust pan set is 8" x 5" plastic.

STRAW BROOM.....$3.75
DUST MOP.....$5.50
SPONGE MOP.....$6.50
EXTRA SPONGE MOP HEAD.....$2.50
BRUSH AND DUST PAN SET.....$2.25
MOP AND BROOM SET (5 pieces).....$20.00

WET MOP.....$3.50
PUSH BROOM.....$7.50
BROOM STAND.....$25.00

FACES PUZZLE & BODY PUZZLE

are made of several layers of wooden pieces which fit inside the wooden frame. The pieces are interchangeable and can be put together in many different ways, inside and outside the frame. They are lovely, educational and engage children for hours. 9½" x 9½"

FACES PUZZLE.....$28.50
BODY PUZZLE.....$25.50

•

In the first Montessori class in Rome in 1906 and today, all over the world, children prefer real work, sweeping, preparing food, caring for plants and animals, building with wood and learning courtesy over "pretend". They chose, and choose, as their favorite toys, real life tools especially made for their use. They work at their own pace with a feeling of joy and satisfaction.

Michael Olaf
(The Montessori Shop)
Catalog **$1** from The Montessori Shop, 5817 College Avenue, Oakland, CA 94618; 415/655-7100.

No. 40-BF; $59.95 Postpaid

Berlin Flyer and Pioneer Wagons

*These days you can pay a lot for a coaster wagon and get an unsatisfying tin box with plastic wheels. Lehman's Hardware (**EWEC** p. 142), that commendable bastion of Amish equipage, stocks what must be the best wagons anywhere. They're heavy-duty (some models can handle half a ton!), with auto-type steering (so they won't tip over in turns), ball-bearing steel wheels, and even inflatable tires on some models. You can get 'em with hardwood bodies or just the chassis and running gear. These are **better** than the one you had as a kid. How about one as a second car?* —J. Baldwin

Berlin Flyer and Pioneer Wagons
$69.95-$299
Catalog **$2** from Lehman's Hardware & Appliances, Inc., P.O. Box 41, Kidron, OH 44636; 216/857-5441.

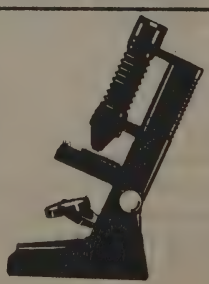
Learning at Home

My kids are in school, but if they were at home I'd probably start with this catalog. —Robin Dreyer

Learning at Home
Catalog **free** from Learning at Home/Dept. 8940, P. O. Box 270, Honaunau, HI 96726; 808/328-9669.

MULTIPOWER MICROSCOPE
Fixed eyepiece with interchangeable objective lenses provide 3 powers (20x, 50x, 100x). Tiltable body, weighted base, swivel mirror, adjustable stage, 3 blank slides, 10 cover slips, accessories (gum media, forceps, dropper/siphon tool), 28 page Discovery guide. 12 pieces, 10 experiments.

B18-0100..... $38.00

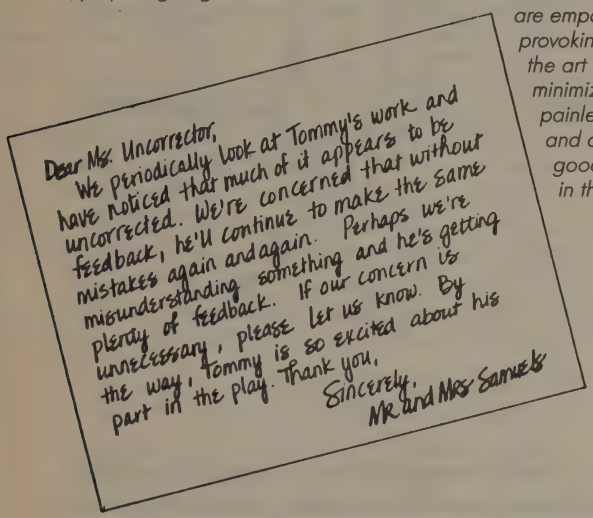


How to Get Your Child a Private School Education in a Public School

This book has become my latest bible in dealing with schools and my children's attitudes towards them. Although I was somewhat skeptical of the beginning chapters' focus on manners in the classroom (thinking it was too late to turn my children into angels at this point), I soon changed my evaluation . . . I was called in for a parent-teacher conference, one of those dreaded events that neither parents nor teachers nor children relish. As one parent moaned in the book, "I get nervous just going to the regular parent-teacher conferences. Just walking into the school makes me feel like I'm twelve years old and in sixth grade again."

In preparing to go to the conference I suddenly remembered this book sitting on my shelf. Would it have a chapter on p-t confs? Sure enough, it had excellent instructions for how to make the most out of these meetings! The ensuing conference was the most comfortable and successful school meeting I'd ever experienced. After that I dove into the rest of the book to discover what other pearls might be there.

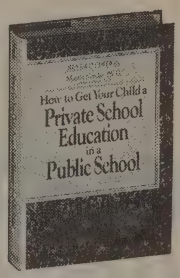
The authors (who are educators and parents) firmly believe that it is not necessary to spend megabucks on private schooling for our kids. Chapters on choosing your child's teacher, how to decide if a school is right for your child, and generally getting your child a "private school" education in a public school are empowering and thought-provoking. Other tips range from the art of being organized and minimizing morning madness, to painless papers, recess success, and dealing with bullies. Lots of good ideas and common sense in this book! —Nancy Rhine



- Choosing a school based on reputation is better than not choosing at all. Some parents don't choose because they think they don't have a choice. Private school is not an option for them, and they believe their child can only attend the local public school. This is often untrue. For years, parents-in-the-know have been getting their children into public schools other than their local one.

- A teacher's defensiveness is equally understandable. How would you feel if you were a teacher? Just babysitting thirty kids for six hours a day, five days a week would be a Herculean task. Imagine also trying to figure out, address all their learning, emotional, and social needs, too! Would you do a teacher's job, even if you had the summer off?

- Pointing out your child's problems too frequently can encourage the teacher to think of your child as a problem child. This can become a self-fulfilling prophecy.



How to Get Your Child (etc.)
Martin Nemko, 1989; 191 pp.
$8.95 ($10.95 postpaid) from Ten Speed Press, P. O. Box 7123, Berkeley, CA 94707; 415/845-8414 (or Whole Earth Access).

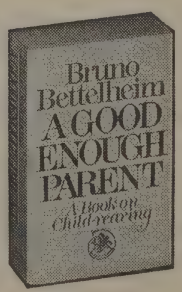
A Good Enough Parent

Books on the right and proper way to raise a child abound — some are even helpful. The late Bruno Bettelheim offers not prescription, but perspective. To strive for perfection is to guarantee failure. But it is quite possible to be a "good enough parent," a parent whose mistakes are "more than compensated for by the many instances in which we do right by our child."

Bettelheim's is the invaluable counsel of a deeply experienced and thoughtful elder. Slow down for a while and listen.
—Keith Jordan

- This book sums up my lifelong effort to discover and test what is involved and required for successful child-rearing — that is, the raising of a child who may not necessarily become a success in the eyes of the world, but who on reflection would be well pleased with the way he was raised, and who would decide that, by and large, he is satisfied with himself, despite the shortcomings to which all of us are prey. I believe that another indication of having been raised well is a person's ability to cope reasonably well with the endless vicissitudes, the many hardships, and the serious difficulties he is likely to encounter in life, and to do so mainly because he feels secure in himself. Although not always free of self-doubt — since only arrogant fools are entirely free of that — whatever happens in his external life, such a person who has been well raised possesses an inner life which is rich and rewarding, and with which he is hence satisfied. Last but certainly not least, to grow up in a family where good, intimate relationships between the parents and between them and their children are at all times maintained makes an individual capable of forming lasting, satisfying, intimate relationships to others, which give meaning to his and to their lives. He will also be able to find meaning and satisfaction in his work, finding it worth the efforts he puts into it, because he will not be satisfied with doing work that is devoid of intrinsic meaning.

- A freely organized ball game looks very ragged, and it *is* very ragged. The children use the game to serve their own individual and group needs, so there are interruptions for displays of temper, digressions for talking things over or to pursue a parallel line of play for a time, surprising acts of compassion ("give the little guys an extra turn") — all acts outside adult game protocols. If adults want to see a polished game of baseball played according to the rulebooks, they need go no farther than their television sets. But in imposing their notions of order on a child's game, they ought to think twice about what they are doing and its likely consequences, and what they are depriving their children of.



A Good Enough Parent
Bruno Bettelheim, 1987; 377 pp.
$11.95 ($13.95 postpaid) from Random House, Inc., 400 Hahn Road, Westminster, MD 21157; 800/726-0600 (or Whole Earth Access).

WARGAMING

A Philosophic and Resource Guide

BY TY BOMBA

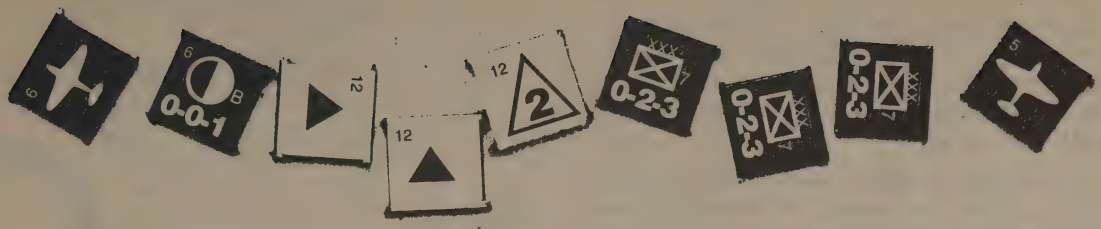
"Lovely it is . . . to witness great battle-plans of war, carried out across the plains, without your having any share in the danger."

The Roman poet Lucretius wrote that in the first century B.C., but it aptly describes the fascination we in the hobby of wargaming have for military history today. Wargaming, in fact, allows you to do far more than just "witness great battle-plans of war"; it provides a handy and bloodless way to explore the might-have-beens of the past and the what-ifs of the future.

If you've seen chess, you've already seen a wargame. That game has antecedents going back to at least 2000 B.C., when it served to teach battle tactics to the males of the royal houses of the Middle East. (And it's actually not a bad simulation of the clumsy and lock-step kind of warfare prevalent in those times.)

Much later, Napoleon brought modern war onto the tabletop when he began the practice of map-gaming all his campaigns, to test possibilities before actually launching them. Later in the nineteenth century, the Prussian General Staff introduced its own officer-training *Kriegspiel*, and from there the idea spread. By 1900, wargames had pretty much become a standard part of all western military establishments.

Ty Bomba is a wargame designer in San Luis Obispo, California.
—Kevin Kelly



Civilian-oriented, commercially sold wargames had their direct beginning in the late 1950s, when a man named Charles Roberts founded The Avalon Hill Game Company. Today there are one or two handfuls of wargame companies, most privately held and all tiny by Wall Street standards. They service somewhere around 250,000 gamers in America, and perhaps up to another million scattered elsewhere around the world.

Going by the survey data I've read and collected, today's typical wargamer is a thirty-something married male (less than 2 percent are female), with a bachelor's degree and some graduate schooling, and an income of $30,000 or more a year. About 30 percent describe themselves as political conservatives, another chunk that size call themselves liberals, and the rest break down fairly evenly into all the other categories between and beyond those two poles. Less than 10 percent are currently serving in the military.

Today's typical wargame has three main components — there's the map, the counters, and the rules.

The map, usually printed in color on thick paper, is generally no bigger than 34" x 22" inches. When the two (or more) players unfold it and set the map between them on a table, what they've got is a representation of the terrain that actually covered the area over which the historic battle or campaign they're about to game-out was fought. That is, the hills, rivers, deserts, cities, swamps, etc., that shaped the history are on the game map. And beyond that, there's usually also a hexagonal grid printed over the whole thing. This serves to regulate the movement of the game pieces the same way the squares do on a chess board. (Hexagons, or "hexes," are much preferred over squares in wargaming because they allow for equidistant movement in all directions.)

The counters, also usually in color and printed on stiff cardboard about a sixteenth of an inch thick, must be punched out of their die-cut holder sheet when you play for the first time. Separated, each represents one unit — which can range in size from individual soldiers on up to whole armies or army groups, depending on the scale and scope of the game you've chosen — and will serve as your chess pieces during play.

The rules are always the most imposing element of the games, at least to hobby newcomers. The simplest wargames have at least four to six pages of them; "intermediate level" games average eight to twenty-four, and the complex "monster games" can range up to 64 or more. And, certainly, having to read between 6,000 and 60,000 words *before* you can start to play a *game* is a daunting prospect for most people. But there are several mollifying factors that can help with those long rules.

First off, you need to understand that the lengthy rules result from the fact that, aside from being "games," these things are also "simulations." (And just where 'game" ends and "simulation" begins is a debate that's been argued in the hobby since the beginning.) That is, they're supposed to model a reality — and war is a very complex reality — as well as to provide tabletop competition and fun. So, for example, if you're gaming a campaign wherein supply, air power, ships, severe weather, political considerations, etc., etc., all played significant parts, you've got to have rules to adequately explain and integrate those things into your play.

Sometimes events that were whole chapters in the real participants' lives can be condensed into a couple of rules paragraphs. For instance, in my latest published design, *Sunrise of Victory,* which covers the middle period of the Russo-German War of World War II, I was able to boil down the entire behind-the-lines partisan battles that raged in Russia to just two paragraphs.

> *Soviet Partisans: Every marsh and rough and forest hex north of the 34xx hexrow and outside of Estonia, Latvia and Lithuania, is known as "Partisan (or 'Injun') Country." Starting on game turn 3 (AUG/SEP '42), once per Soviet-Prepared Assault Phase, that player may call out a major partisan effort to aid one of his attacks in partisan country.*
>
> *The effect of partisan participation in a Soviet-prepared assault is to decrease the enemy's defense strength by 10 percent and to reduce to 3 the maximum number of hexes that force may retreat-after-combat.*

At the same time, the material I had to include to cover the complex logistical situation both sides faced in that conflict ran to a little over 4,500 words.

Now (and here's where the mollifying comes in), *no one* ever attempts to memorize the rules word for word. You keep them close by during play, highlight critical parts, and stop play whenever necessary to check on some fine point. Doing it that way, after your first few turns you find you begin to internalize the rhythm of things, and from there play starts moving faster and more smoothly until the rules

hardly get picked up at all. Further, though individual wargames vary in their details, they all tend to share large chunks of the same basic rules, so your second wargame is a lot easier to get into than was your first, and so on.

Just like chess, wargames make a terrible spectator sport for the non-aficionado. Since wargame maps are usually bigger than chess boards, but with movement and detail measured much more finely, you've practically got to have a player's-eye-view to make out what's going on. For a player, though, there's no greater tool available for understanding military history and strategy. It doesn't matter how many prize-winning histories of, say, the Gettysburg campaign you read — after you've tried and failed (or maybe succeeded) to get Pickett's division through the Union center, you'll know better than any prose could convey just what was involved and at stake there.

And that's the really great feature of wargaming — it turns even the most ancient history into something happening before your eyes *now*, and something that can be made to work out differently, depending on the relative skills of you and your opponent. You both start with a representation of what your historic counterparts had in real life, but where you take it from there is up to you. Try sending Pickett around the Union left instead; see how the battle progresses then.

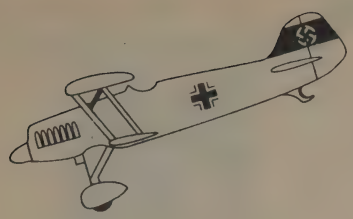
Alternatively, you can play games that try to model some war that might yet happen. For instance, the most popular titles in this category (until just recently, anyway) are ones based on a premise much like the one described in Tom Clancy's bestseller *Red Storm Rising* — that is, a Warsaw Pact invasion of western Europe. (And, of course, it's this kind of play that comes closest to the old military officer-training function of wargames.)

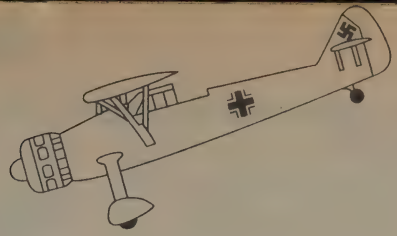
And beyond that, there's even another category of games, called "alternate history," now gaining in popularity. These take some historic event, flip its outcome around, and then present you with a game based on that reversed starting point. My contribution to this genre has been a game I called *Tomorrow The World.* The idea behind it was to see what would've happened if Nazi Germany and Imperial Japan had won World War II instead of the Allies. My supposition was that by 1948 they'd divided the whole planet between them, setting up vast imperialist empires and puppet states, etc., then squared off against each other in a final contest for global dominion. (Play usually ends in a mutual loss, with the world spiraling off into eternal nuclear winter.)

And all that, of course, presses our noses right up against the wall whereon is painted the question, in large letters: JUST WHAT THE HELL KIND OF PERSON PLAYS THESE GAMES!? Do wargamers enjoy violence, bloodshed, pain and death!? The

short answer is that — except for an almost un-American fascination with history — the typical wargamer is a fairly normal citizen, and — no — we don't enjoy or crave any of that violence stuff.

In more personal terms, let me give you an example from my own life. A few years ago I dated a woman who was what you could call, I guess, a non-denominational Buddhist. As we left for an evening out, in answer to her question, "How'd it go with you today?" I related my wargame triumph of that afternoon. We'd played a game covering the entire European Theatre of Operations in World War II; I'd commanded the Germans, and pulled off a total victory. My retelling must've gotten too glowing, because her reaction was, 'Oh, Ty! How can you be glad about something like that? If what you did





really happened, think of all the millions more who would've died!"

Right. There's an old Japanese proverb that tells about a man who was charmed by dragon art. He kept paintings of dragons on the walls of his home and statues in his yard. One day the dragon god noticed this and caused a real dragon to appear before the man. The fellow keeled over dead with a heart attack. The moral, for me and other wargamers anyway, is that the dragon god should've minded his own damn business.

What we're interested in is war as history, not war as a way of life. When we play wargames, no one bleeds or dies or goes insane with hurt; it's all just cardboard moving across paper. Nevertheless, I present you with this aspect of things as a caveat — if you play wargames long enough, someone in your circle will brand you as bloody-minded or meanspirited. My answer to that kind of thing is always to probe back by asking: if it's bad to replay these histories, maybe it's bad to read about them, too, or even to think about them? Some get it, some don't.

COMPUTERIZATION

For over a decade now, the hobby's been filled with prophets telling us the future lies in electrification. The computer's immense memory and data-handling capabilities, we were told, would make the use of the complex rules far simpler and more accessible to broader audiences. That may yet be the case. (And let me put in here that I'm no cyberphobe. I began using computers in 1977, and am composing this article on my Mac Plus.)

Throughout the eighties, several software outfits made handsome profits putting serious wargames into computer format. (Their big drawback for those of us used to the paper games was the small screen — you have to scroll around to view the whole map, which can really slow strategic thought. Also, at this stage of things at least, those who are the best at computer programming tend not to be the best at history modeling.) But just recently the grapevine has begun to tell of slackening sales for computer wargames.

It seems the retailers would rather use the shelf space to stock Nintendo and other related arcade-style games. And that only makes sense, since a typical computer wargame will have sales of 10,000 to 40,000 units, whereas even the least popular Nintendo/arcade game can be expected to top 100,000. Now, that's not to say computerized wargames have no future, but they do seem to have run into at least a temporary wall of retail resistance.

RESOURCES

The bloody-minded and meanspirited among you can get into wargaming through the following sources.

Command Magazine: This is my baby. We publish six times a year, with a complete wargame in every issue. In addition to the game, there are articles explaining the history behind it, along with other pieces on everything from Jimi Hendrix's life as a paratrooper to Saddam Hussein's politics, and combat philately. Subscriptions are available for $24 for 3 issues, $40 for 6, or $70 for 12. Command Magazine, P.O. Box 4017, San Luis Obispo, CA. 93401; (805) 546-9596.

Cummins Enterprises: These folks publish two journals (*Fire & Movement* and *Wargamer*) of wargame reviews and how-to strategy articles for existing games (games not included). Subs cost $25 for an 8-issue year. Write to: P.O. Box 1289, Salinas, CA 93902.

The Avalon Hill Game Company: The granddaddy of all wargaming. "A-H," as they're affectionately known, maintain a large line of paper and computer wargames and publish their own journal, *The General.* Call or write for their latest catalog: 4517 Harford Road, Baltimore, MD 21214; (800) 638-9292.

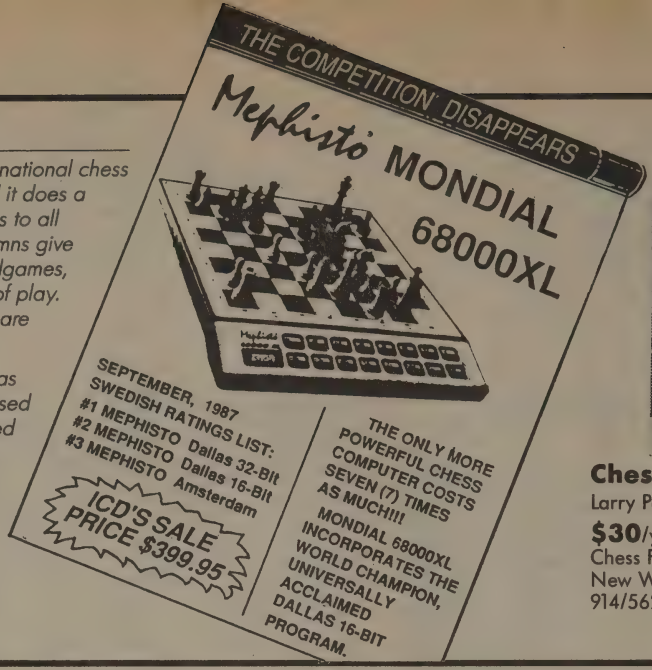
Computer Games: I'm not nearly as familiar with this end of things, but a visit to any well-stocked newsstand will put you within arm's reach of a rack full of computer-gaming magazines that will have all the information you could want. The ones to ask for are: *Computer Gaming World, Game Player's PC Strategy Guide, Electronic Gaming Monthly,* and *Video Games & Computer Entertainment.* ■

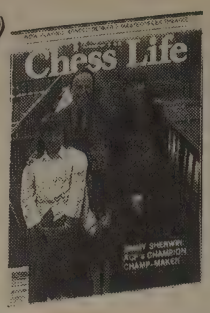
Chess Life

*There is one and only one national chess magazine, **Chess Life**. And it does a good job of being all things to all chessplayers. Regular columns give instruction in openings, endgames, or some particular aspect of play. Postal chess and problems are also covered.*

As competitive as a sport, as graceful as art, as data-based as a science, as one-minded as meditation, chess is the quintessential game. Only the Oriental game Go compares to it as a source of endless fascination.

—Richard Virdone



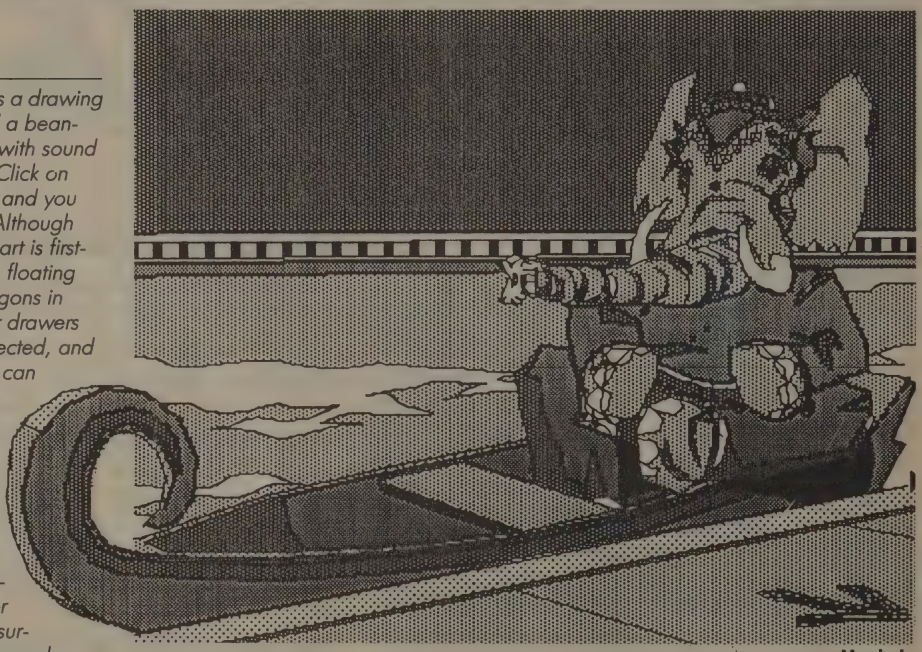


Chess Life
Larry Parr, Editor
$30/year (12 issues) from U.S. Chess Federation, 186 Route 9W, New Windsor, NY 12550; 914/562-3555.

Manhole • Cosmic Osmo

Manhole's opening screen has a drawing of a manhole. Click on it, and a beanstalk starts to grow, complete with sound effects and crude animation. Click on various parts of the beanstalk and you find yourself in other places. Although the animation is primitive, the art is first-rate, with costumed elephants floating down underground rivers, dragons in dungeons, rooms with dresser drawers that can be opened and inspected, and books inside the drawers that can be opened and read. Doors squeak, creatures speak, and everything is connected to everything else in surprising ways.

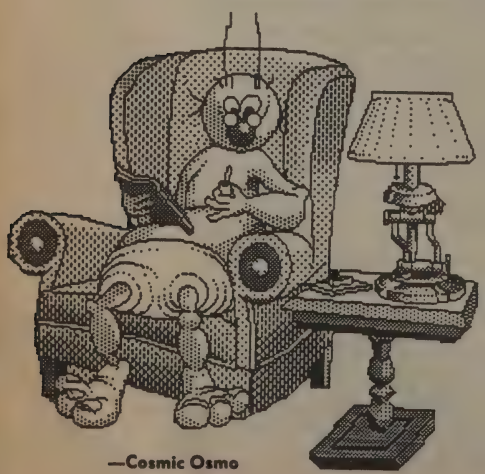
Manhole turned my five-year-old daughter on to HyperCard, the Macintosh build-it program; Mamie hacked her way through the labyrinthine surprises of the Manhole underground wonderworlds — which took a couple months all told — then I showed her how she could roll her own adventures using the paint tools and button tool. She turned to Manhole for spare parts, copying parts of screen dumps of Manhole to her own stack. (I assured her that since it was for her own use, she was not violating any intellectual property rights.)



—Manhole

Yesterday, when she wasn't looking, I loaded a new adventure — Cosmic Osmo — onto her hard disk. I came back an hour later and found that she had discovered how to steer the spaceship, where she could find a typewriter and write her own name, where she could open a drawer, take out the jigsaw puzzle, and put it together. Like Manhole, this graphic-sound-and-a-little-text adventure is steerable simply by clicking on parts of the screen. Mamie knows the command-key combination for detecting hidden buttons when she is frustrated, so she's been zooming through it. There are more things to do hidden in the Cosmic Osmo universe — puzzles to assemble by clicking and dragging, telephone numbers to dial, typewriters to operate, even computerized Mr. Potato-Heads! I must confess that I've spent an hour tooling around this oddball cosmos myself.

—Howard Rheingold



—Cosmic Osmo

Manhole

$49.95 (floppy disk)
$59.95 (CD-ROM).
For Macintosh Plus and hard disk.

Cosmic Osmo

$69.95 (floppy disk)
$79.95 (CD-ROM).
For Macintosh Plus and hard disk.

Both from Triton, P. O. Box 8123, San Francisco, CA 94128; 800/227-6900.

The Journal of Computer Game Design

This newsletter began as an incentive for a rather isolated computer gaming community to draw together on common issues, some of them economic and market-oriented. But the thrust of its vision is that computer games should approach the complexity and overall awesomeness of both literature and computer interactivity.

Each issue has some thoughtful essays on gaming theory as well as nuts-and-bolts stuff on coping as a computer game author in a world where applications writers are kings. The current ish, for example, has a good article by Brenda Laurel on encouraging more women-oriented games.

*The **Journal** has been successful in its mission as the glue of the computer-gaming community, and editor Chris Crawford has helped organize an annual convention of authors. Chris' writing is the backbone of the **Journal**, and his prose, like his games, is never less than provocative and engaging.* —*Steven Levy*

•

What would I design as a computer game for women? A Central American adventure with a female peace worker as a central character, perhaps, or a space opera with a woman starship commander, or a coming-of-age tale about kids of both sexes (as once suggested by Tom Snyder and immediately incinerated by his potential publisher). What would I suggest as design themes for developers who want to address the female market? Yes, games of sexual conflict would be fun (especially in the style of Shaw or Austen). Games that offer young women healthy role models in contexts that are not traditionally "female". Games about the moon-and-magic side of the female cultural icon, where intuition and connectedness to the earth are reformulated and celebrated. Games where women have relationships with other women as robust and trustful as those between men. —*Brenda Laurel*

•

Interactivity is the *basis of competitive advantage* of the computer. Sure, the computer can do a lot of things, but the one thing that it does better than any of the competing media is interactivity. And the wise businessman always throws his resources behind his basis of competitive advantage.

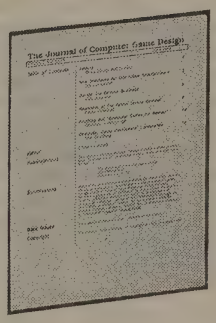
•

Games offer more interaction than spreadsheets or word processors.

That is why games come closer to the essence of computing than any other field of software.

•

In most interactive fiction products, characters are treated as objects. Most interactions with other characters are limited to making imperative statements to them (giving commands). True interaction with characters is impossible in these worlds because the representation of the world is void of any "interactive media". You cannot talk with them because there is nothing to talk about. In worlds containing only objects, the only topic of discourse is the "object economy" (physical objects that may be manipulated). In order to produce interaction on more human terms, a system must have (1) a rich representation for emotions, knowledge, and beliefs (an "emotion economy" and an "information economy", terms coined by Crawford); (2) a rich set of behaviors that are driven by these new economies; and (3) a rich grammar for communication of knowledge, events, beliefs, and emotions. These subsystems must be fully integrated with each other. One would not want to design-in emotions that cannot influence behavior, or that cannot be expressed using the input grammar.



The Journal of Computer Game Design
Chris Crawford, Editor

$30/year (6 issues) from The Journal of Computer Game Design, 5251 Sierra Road, San Jose, CA 95132.

Secret of San Saba

The dedication serves as both introduction and warning: "Dedicated to the yarn-spinners and bullshitters of yesteryear. Without them, Texas is becoming as dull as most places." What follows is an epic story based on fact, illustrated in comic format. What is real, what is myth, and what is just plain bullshit is hard to know. Whatever it is not, it is good, literary and visual entertainment.
—*Richard Schauffler*

Secret of San Saba
Jack Jackson, 1989; 151 pp.
$12.95 ($14.45 postpaid) from Kitchen Sink Press, 2 Swamp Road, Princeton, WI 54968; 414/295-6922.

The Language of the Goddess

This long-awaited book takes Marija Gimbutas's explorations of the Goddess culture further than ***The Goddesses and Gods of Old Europe*** *(reviewed in* ***WER*** *#62, along with an interview with the author). Looking only at European evidence, Gimbutas attempts "to widen the scope of descriptive archeology into interdisciplinary research." She calls this endeavor "archeomythology, a field that includes archeology, comparative mythology, and folklore, and one that archeologists have yet to explore."*

Indeed. Academia is having a hard time with Gimbutas, particularly because she is a renowned scholar and not just another New Age ideologue with a book to peddle. Her findings, from numerous digs mostly in the Balkans, are not in dispute. Her interpretations are. (In a recent articles in ***The New York Times****, "Idyllic Theory of Goddesses Creates Storm," the male reporter demonstrated balance by finding four academics critical of Gimbutas's theory: two women and two men.)*

It's hard for us to accept the notion that there was a time long ago (6500-3500 B.C.) when God was a woman, life was peaceful, and patriarchy hadn't been invented yet — our entire culture and language predispose us against the idea. But here is Gimbutas telling us, literally, that black is white. She says that in Old Europe black was the color of fecundity, like a dark cave or rich topsoil, white was the color of death, as in bones, and red ochre the color of life. It is no accident that this handsomely designed book uses this color scheme throughout, with stunning results.

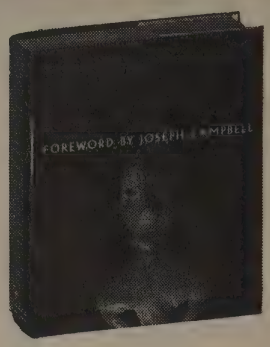
Is this just a coffee-table version of her earlier book at three times the price? I say no; there's more here and it is beautifully presented. Perhaps the best way to approach this book is to sidestep the debate over meaning, and just admire close to 2,000 ancient artifacts. ***Something*** *was going on back then.*

—Richard Nilsen

•

No symbol can be treated in isolation; understanding the parts leads to understanding the whole, which in turn leads to identifying more of the parts. This book explicitly seeks to identify the Old European patterns that cross the boundaries of time and space. These systematic associations in the Near East, southeastern Europe, the Mediterranean area, and in central, western, and northern Europe indicate the extension of the same Goddess religion to all of these regions as a cohesive and persistent ideological system.

This extraordinary mammoth-ivory sculpture conflates breasts and buttocks into a zone of eggs circling the figure's middle. Gravettian-Upper Perigordian (Des Rideaux, at Lespugue, Haute Garonne, France, c. 21,000 B.C. Breasts-buttocks in front were found damaged; here they are shown in reconstruction). H. 14.7 cm.



The Language of the Goddess
Marija Gimbutas, 1989; 388 pp.
$49.95 postpaid from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

Shiva and Dionysus

Old gods don't always die when younger traditions overtake them. Some of them live on like viruses, within the body of the host religion, passing their ancient messages along in symbols, saints, rituals, and parables that are adopted by younger religions. When the Akkadians invaded the isolated mountain valleys of Greece, bringing with them Zeus and the pantheon of Olympus, they found that the natives continued to sneak off into the forests to worship their old hairy god, Dionysus, patron of wine, ecstatic intoxication, sex, dance, transcendence, and the theater. And when the Aryan invaders brought their Hindu pantheon to the land of the Dravidians, they found that the natives continued to sneak off into the forests to worship their old hairy god, Shiva, patron of cannabis, ecstatic intoxication, sex, dance, transcendence, and the theater.

All over India, Shiva Lingams — stone phalli, garlanded by fresh flowers — are to be found to this day in even the tiniest villages. And similar monuments also have been uncovered in Corsica and Crete. In the hills of Morocco, rites are still performed in the same manner they were performed eight thousand years ago, when Shivaism was codified. The author calls Shiva and Dionysus "the omnipresent gods of transcendental ecstasy," and throughout the book interweaves stories and discoveries about the emergence and incredible tenacity of these two religious cults from opposite ends of the world, whose histories go back to the Neolithic. The resonances between the Eastern and Western branches of these traditions are remarkable, and sometimes surprising, as in his revelation that the Western Christian image of the devil as a horned, tailed figure, wielding a trident, is derived from Shivaism.

—Howard Rheingold

•

Shivaism has always opposed the anthropocentricity of urban society. Its western form, Dionysism, similarly represents the stage where man is in communion with savage life, with the beasts of the mountain and forest. Dionysus, like Shiva, is a god of vegetation, of trees and of the vine. He is also an animal god, a bull-god. The god teaches man to disregard human laws in order to rediscover divine laws. His cult, which unleashes the powers of soul and body, has encountered a lively resistance from city religions, which have always considered it antisocial. Shiva, like Dionysus, is represented by city religions as the protector of those who do not belong to conventional society and thus symbolizes everything which is chaotic, dangerous and unexpected, everything which escapes human reason and which can only be attributed to the unforeseeable action of the gods.

Shiva and Dionysus
Alain Danielou, 1982; 250 pp.
$8.95 ($10.45 postpaid) from Harper & Row, Rt. 3/Box 20B, Hagerstown, MD 21740; 800/638-3030 (or Whole Earth Access).

Religion Watch

The bane of the Information Age we live in is too much damn information thrust at us from every corner. Thus every good info packrat loves newsletters, abstracts, and other condensed publications that help keep them in touch with far more print media than any sane person could read on their own. ***Religion Watch*** *is an engaging monthly newsletter presenting summaries of important articles, trends, and news of contemporary religion. Editor/publisher Richard P. Cimino has a good eye for what's bubbling to the surface in religious circles and the publications cited range from religious media such as* ***Charisma***, ***Christian Century***, ***Hinduism Today***, *and* ***National Catholic Reporter***, *to important dailies such as the* ***L.A. Times****. Cimino's summaries are as even-handed and objective as one could wish, with a lively tone and a noted absence of sarcasm or hidden agenda.* —*Jay Kinney*

Religion Watch
Richard P. Cimino, Editor
$17.50/year (11 issues) from
Religion Watch, P. O. Box 652,
North Bellmore, NY 11710.

•

The world's oldest continuing free thought, atheist magazine *The Truth Seeker* has recently made the unusual transition from publishing such free thinkers as Thomas Paine to featuring articles on ecology and spirituality. The current issue of the magazine [March/April '89] announces that it will blend together traditional free thought with "new inquiries concerning the nature of human consciousness, the evolution of the spiritual nature of Homo Sapiens . . . a re-examination and re-definition of the traditional concepts of 'God' that have historically robbed humanity of its dignity and true spirituality." Most of the issue is devoted to the "Gaia" principle, which teaches that the earth is a spiritual force (or "consciousness") that sustains itself without human help.

•

American Indian leaders and activists are growing increasingly critical about how their religious tradition is being appropriated by teachers in the New Age movement and academia, according to Ward Churchill in the *Bloomsbury Review* (Sept./Oct. '88). ". . . at this juncture, scarcely an Indian in the United States has not been confronted by some hippie-like apparition wishing to teach crystal-healing methods to Navajo grandmothers, claiming to be a pipe-carrier reincarnated from a seventeenth-century Cheyenne warrior, and usually with an assumed 'Indian name' like Pretty Painted Arrow," writes Churchill, a Creek-Cherokee. He adds that teachers of native American spirituality, such as Hyemeyohsts Storm, and David Seals, have gained credibility in academia and have misrepresented such teachings as they adapt them to a "EuroAmerican" audience. Accounts of American Indian religion by such figures as Carlos Castaneda (author of "The Teachings of Don Juan") and Jamake Highwater have now worked their way into college curriculums, even though much of their work is not based on fact, he writes.

•

Christ the Savior Brotherhood has recently made the unique transition from the New Age movement to Greek Orthodoxy. The Forestville, Calif.-based community was formerly known as the Holy Order of MANS, a group pioneering in the "Aquarian Age" and esoteric religion, seeing Jesus as an "avitar" of the New Age. Since 1974, the group was divided between the New Age religion and Christianity, but last year the Brotherhood — which publishes the magazine, *Epiphany* — was received into the Orthodox faith. The 1000-member brotherhood (spread throughout the U.S.) is unique in Eastern Orthodoxy for its formation of lay communities, but it is part of a trend of other Christians converting — sometimes en masse — to Eastern Orthodoxy.

•

Folk Religion Persists
Among China's Peasants

The *Peasants Daily* reports that a pine tree has become an object of worship because of "healing water" that drips from its leaves. The tree, in the village of Jiangsu, has attracted more than 40,000 visitors, where some have claimed that they were healed and saw 32 Buddhas in its branches. The tree was eventually cut down by public security officials, who claimed that the water was in fact the urine of millions of insects. The *China Women's Daily* reports that 51 young women in the "backward" Jiangxi Province have died in fifteen group suicides in the hope of being reincarnated as city women. Parents of the victims have disowned many of the dead girls because of local superstitions, according to the paper. Some corpses were buried on wasteland and others were nailed to their coffins to stop their spirits escaping (to haunt their families).

One girl was reported as saying before she died, "At home we are controlled by our parents and when we marry by our husbands. City girls wear fine clothes and go to fine cinemas . . . It is the life of an angel."

•

Although not well known, new Calvinist intelligentsia are wielding a growing influence in American evangelicalism. This can be seen in the growing appeal of the theonomy (or reconstructionist) movement — which seeks to establish a theocracy run by Old Testament laws — as well as a broader, more moderate Calvinist movement working to reshape the cultural and political attitudes of evangelicals. The evangelical *Christianity Today* magazine (April 21, '89) reports that both advocates and detractors of theonomy "agree that the movement's influence is on the rise."

One theonomist said the movement's popularity is reflected by "increased demand for Reconstructionist literature and speakers among Christian colleges. Publishers, including Nashville, Tennessee-based Wolgemuth and Hyatt, are increasingly supplying outlets for authors who tend toward theonomic analysis."

It's Your Choice

A completely unsentimental handbook covering everything from choosing a coffin to applying for veteran's burial benefits. The author works for the American Association of Retired Persons, and his prejudice against the funeral industry is frequently bared in this book. Each short section is followed by an even briefer section of important points to remember, making it easy to digest in short chunks. The last fourth of the book is a lengthy form to be used for price comparison and instructions to survivors.
—*Sallie Tisdale*

•

Remember: A casket is an item of merchandise. It may be in a funeral director's best interest to sell you an expensive one. • Decide on the kind of casket you want and how much you want to spend before you go to the funeral home. • Think about why you are buying a casket. Be alert to sales pitches that appeal to your emotions, feelings of guilt, pride, or concern with the protection or "preservation" of the remains. • If you don't see a casket you want at the price you want to spend, ask for one. • If you are arranging for a direct disposition, think seriously about purchasing an inexpensive alternative container (of canvas or cardboard) that will adequately meet your needs.

It's Your Choice
(The Practical Guide
to Planning a Funeral)
Thomas C. Nelson, 1983; 118 pp.
$4.95 ($6.70 postpaid) from
Scott, Foresman & Company, 1900 E.
Lake Avenue, Glenview, IL 60025;
708/729-3000
(or Whole Earth Access).

THE WELL TURNS FIVE

BY JOHN COATE

WHAT IS THIS?

The next few pages are the WELL newsletter, inserted into the magazine. The WELL is Whole Earth's computer conferencing system. It's a lot of things — an interactive Sunday paper where the subscribers talk to each other, a "people's think tank," a virtual Wild West saloon where you never know who's going to come in through the swinging doors, a potluck for people who love ideas, discourse and language, and a place to get a good intellectual massage. It's a place where professional and personal interactions overlap, weaving a tapestry of interactivity that approaches a village-like quality in an electronic environment.

We used to mail out a separate four-page newletter but we thought that by including the pages in the magazine we could give *WER* readers some idea of what the WELL was about, and WELL subscribers could get a look at *WER*. Should we do this again? —JC

APRIL 1990 was the fifth birthday of our "virtual village." So this seems like a good time for a little history . . .

In the Info Conference the WELL's first director Matthew McClure recalls the WELL's early history:

"First, there were a bunch of us founding the WELL, and Stewart's vision was very important in the design. Luckily, we shared a lot of ideas about how things should go and what our purpose was: to facilitate communications among interesting people in the Bay Area; to offer fairly sophisticated conferencing at a revolutionary low price; to bring the benefits of electronic mail to the masses.

"To implement that vision, we reasoned that we needed a collection of shills who could invite people into the tent, so we drew up a list of subjects we thought would make interesting conferences, and then thought of who we knew who would make good hosts, and offered them free accounts. Attractive nuisances, if you will. We wanted to see how close we could come to a modern-day Paris salon . . . or salons, actually, since we thought each conference had the potential to be a hub of intellectual activity in itself.

"One other decision that was heavily influenced by Stewart as a biologist was that our growth should be as organic as possible — that we shouldn't take out flossy ads and spend a bunch of money to get lots of people online at once.

"The initial community was composed of two kinds of people, mostly — hackers and computer-literate journalists: that was who we knew. The hackers we'd met at the first Hackers' Conference, so we did a mailing to them all, asking if they were interested in our nascent online service. The journalists got free accounts for the first several months, as we sat there watching them discover all our shortcomings and still be kind to us in print.

"Another major event was the organization of the Deadhead conference and subsequent promotion via interview and occasional remarks on KFOG. Suddenly we had an onslaught of new users, many of whom possessed the single characteristic that most endears a user to a sysop: ratchet jaws. The Deadheads came online and seemed to know instinctively how to use the system to create a community around themselves."

The other day I asked Cliff to give me a quick list of ten seminal WELL events and here's what he gave me (plus one):

April 1985: The WELL opens for business.

Spring 1985 — Spring 1986: The Beta Test of the PacBel Packet Service — gave toll-free access to most of the Bay Area. Shot our population up to critical mass for sustained interaction and expansion of the conference pool.

Late 1985: The Tainted Canteloupe Hassle. One user accuses another of making libelous public remarks on the WELL for the first time. WELL admin has its first big test of handling big public hassle where users took sides.

Spring 1985: The installation of X.25. Gave cheaper access to long distance users. We went from Uninet to Telenet to Tymnet and finally to CompuServe.

1986: The WELL's first "vibes magician" creates the first deep rifts in the WELL's public conscience. An extraordinary case which forced the WELL to perform its first user expulsion for "misbehavior."

Spring 1986: The arrival of the Deadheads. A self-sustaining, self-regulating population begins in-

Corinne Cullen Hawkins

The WELL crew: tex, fig, nancy, dhawk, calliope, robngail.

The Crew Gets Bigger

Bigger boats require bigger crews. While the WELL arguably could still be called the Mom-and-Pop Store of Telecomm, we've had to enlarge our staff over the years to better handle our growing business. For the first ten months the WELL staff was just one person: Matthew McClure (mmc).* In January 1986, John (tex) Coate was hired to do marketing and customer service. When Matthew moved on in late 1986 Cliff Figallo (fig) became the WELL Director. Robin Ramsey (robngail) joined as the Accounts Manager in 1987, along with David Hawkins (dhawk) who became our System Administrator.

In the past year we've added two new people to the crew, and in a short time each one has made a huge difference in our ability to get everything done.

In May 1989, Nancy Rhine (nancy) joined us when we created a separate department for customer service. She looks out for the needs and problems of new users, co-hosts the new Entry Conference, processes new registrations, and manages all of the tutorial and help resources, including our vastly improved new WELL Manual.

Hilarie Gardner (calliope) came aboard in December 1989 as a general Administrative Assistant, which means that she helps different ones of us on various projects. In the process she's getting us all a lot more organized.

All of us act as "innkeepers" tending to the numerous daily tasks that can't be categorized by job description. It's important that even in the techno-world of computer communications, the WELL is managed and inhabited by identifiable friendly human beings.

* On-line ID.

habiting a part and discovering the rest of the WELL.

Summer 1986: Creation of the True Confessions conference: a channel encouraging WELL members to reveal more of their real selves.

Fall 1986: The first WELL Office Party. The WELL begins sponsoring monthly open-house parties where WELLbeings can meet face to face. There have been many variations over the years including picnics, beach parties, and the classic Casino Party.

Winter 1987: The WELL covers its operating expenses for the first time and reaches profitability. We have proved that without targeted marketing to businesses and corporate customers, a system based almost completely on mutual random interaction can sustain itself.

April 1989: The installation of the Sequent. It removes the barriers of slow performance that the WELL has operated under for its first four years.

Winter 1989: The 64-user UNIX license. We finally exceed the capacity of the first level of UNIX licensing and the first rack of serial ports on our computer.

Tex's Bit Bucket

The WELL has been around for five years, but it hasn't been until recently that we've begun to investigate the dynamics of what people do on the WELL. Jim Rutt put together a method for gathering detailed data on how many people go to a conference and how many people actually say something. You might call it the "poster"-to-"lurker" ratio. So far we've only run stats on a couple of conferences like Info and Books

but we have learned a few interesting things. In the Info Conference about a third of the people who visit make some sort of comment. In the Books Conf it's even higher; almost all of the visitors to the conference posted at least once. But the people who make the most visits are also the ones who talk the most. "Maniac readers are maniac writers," as Jim puts it. Topic 304 in the Info Conf has the details . . . This year we're really focusing on changing the conferencing software. We're looking at Caucus and AKCS, altering them so they look like PicoSpan. But on another front, Mitch Kapor and others are discussing the design of a completely new product that will be based on our collective years of experience. The Great Conferencing Software really hasn't been written yet. Maybe this will be it . . . In Oct. '89 we began mailing out our totally revised WELL Manual to new customers. This mag opus was written by Weird Conference host John Hoag to universal acclaim. Any old-timers who may be rusty with their grasp of WELL workings can catch up quick by ordering the new manual for $6. Email nancy or phone us at the office. Also, for $1.50 you can get the WELL Command Card and Map for really quick reference . . . The WELL has always been a bundle of different communities of interest. Lately there have been some interesting new additions. Largely through the efforts of Jay Allison (jwa), the Radio Conference is now an online home for a group of independent radio producers. Steve Cisler (sac) after years of effort has gotten a good-sized group of professional online searchers and librarians to convene here. Over in the Info Conference Howard Rheingold (hlr) and what I call the Virtual Reality Club have been having long deep discussions about the technology and social implications of virtual reality and cyberspace . . . The Words Conference has a couple of online parlor games that have been ongoing for a couple of years. You play "Fictionary" and "Poetry, Son of Fictionary" by making up and then guessing the right definition for a word or last line of a poem. In the Books Conference they play the "Mystery Logout Quotation," sometimes called "pandaland," where some players are breathtakingly literate . . . In the Telecom Conference, that venerable pioneer Dave Hughes and others are giving the reports from logging in to the first-ever BBS systems in the USSR and Estonia . . . the latest round of great tales from real life are in the "Sea Stories" topic in the Archive Conference. Chuck Charlton (fluster) has been reminiscing about his days aboard US Navy submarines. These are unique and fascinating accounts . . . If you're in the Bay Area either as a resident or a visitor, look in the News Conference for announcements of the monthly WELL Office Party. All are invited to join us. It's usually the third Friday night of each month. The summer months do have some variations that have become traditions. In July we have a picnic in Berkeley and in September we have a beach party out at Muir Beach . . . It came out of another context but it seems to fit the WELL: Fast, Cheap, and OUT OF CONTROL!

The following are two examples of what might be called "spontaneous online bop prosody." The first is by the host of the WELL's Weird Conference and certifiable telecomm pioneer, John Hoag. The second is an exchange from the WELL's Words Conference where host Phil Catalfo occasionally answers questions for the realitylorn . . .

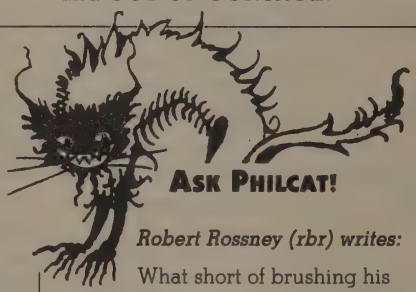
The Weird Earth Review

By John Hoag (loca)

ORDER *N*O*W*!!!
Future issues will include:

- A Cottage Climber's Guide to Nanopathic Homeolifestyling
- Aquacottage Co-Culinarianism
- Backblather: Readers' Regurgitations on WER
- Blueprint for Technodise
- Computers as Condiments
- Folk Songs of the Canadian Gulag
- Gas-Powered Variable Speed Recipe Saw Goes Where No Recipe Saw Has Gone Before
- Learning About How to Learn About Learning
- Let Your Lichens Do It For You
- Living In Nanodwellings
- Oral Cybersexuality
- Polyethylene Landscaping
- Roadside Metastratification Technobiography Tools
- Rote Intuitivity Design
- Spacebreaking For Seventh-Graders
- Sub-Carrier AIDS Transmugenics: New Hope?
- The Co-Biometatechnolinguistical Bible
- The Dogs of Western Spirituality
- The Kumkwat People
- The Problem With Solar-Powered Flashlights
- Toiletside Recycling Containers: Tools for the Behind
- Urban Canoe Trips
- Welfare Telecom
- What Farmers Do With Used Rubbers
- Zen Killing, Zen Burning, Zen Raping
- AND MORE!!!!

(NOTE: submit your article suggestions below — in self-addressed cryobionic envelope interfacers PLEASE!)



Ask Philcat!

Robert Rossney (rbr) writes:

What short of brushing his teeth nightly can I do to improve my cat's breath?

Phil Catalfo (philcat), that oracular font of wisdom, responds:

Your cat's breath cannot be improved no matter what you do; better you should start eating whatever he eats so you won't notice anymore.

rbr (A Hogshead of Real Fire):

Philcat — I did what you suggested. Frankly, it was pretty disgusting getting down on all fours and munching away at Friskies and Kal Kan alongside my cats. They didn't like sharing (even though I put down a third bowl for myself). Darcy only ate a few bites before nervously running off, and all through my first meal Fitzwilliam made scary growling noises and glared male-

Dialing for Modems

The numbers below are the direct-dial ports, current as of summer '90. The arrangement changes from time to time. Current port numbers can be viewed by typing: cat/etc/ttys.doc (when you dial (415) 332-6106, the call "hunts" down the line of modems until it finds an open port). If you have a 2400-baud modem, skip the first four numbers and dial 332-7398. All of the Berkeley lines use 2400 baud so if you call them with 300 or 1200 baud, you may need to hit the cr or type a few @@@s to get the modem to flip down to the right speed. If you live outside the Bay Area, you can connect to us via the CompuServe Packet Net (available in most cities) for a greatly reduced connect charge.

Call the WELL office (415/332-4335) for details.

Sausalito			*Berkeley*
332-6106	332-7217	332-1396	848-0841
332-6258	332-7230	332-1475	848-0842
332-6292	332-7241	332-1476	848-0843
332-7395	332-7358	332-1477	848-0844
332-7398	332-7404	332-3970	
332-7190	332-0928	332-3973	

Want to Subscribe?

Any combination of computer and modem can log into the WELL. To register simply call the WELL's modem number (415/332-6106) and type **newuser** at the login: prompt.

volently at me over the rim of his bowl with his one good eye while he ate. I won't describe the taste, because I know some of my fellow Wellbeings have sensitive stomachs, but "repellent" pretty much sums it up. Burping afterwards was sheer horror.

After a couple of days, though, I got used to the taste. I came to rather like the Kal Kan Mealtime, Kitty Stew, and "With Trout" flavors, though I could take or leave the Kidney Dinner. The Friskies (we have a 15-pound plastic tub of the Ocean Fish flavor, which will take some time to work through) were a little bland, but once I got used to the gritty texture, I came to enjoy the scraping sensation that I got from crunching on them.

One evening a strange transformation began to come over me. I was halfway through a can of Bits o'Beef Dinner, watching the Kirov on cable, when I began hearing faint but insistent voices: " . . . of ancient women gathering fuel in vacant lots . . . so come on, come on down, you got it in you, you got to scrape the shit right off your shoes . . . sure, I'll have some rough nights once I've sent you over . . . to find the light of meaning in the darkness of mere being . . . sure, go ahead, capitalize the T in Technology, deify it if it'll make you feel less responsible . . . there's a shorthand typist taking seconds of her minutes . . . apparent anomalies in the orbit of Neptune . . . the duck and the decorated shed . . . but few, I think, do there embrace . . . " Each voice seemed insistent and distinct. They began sounding louder, more firmly, speaking with authority, and as they did so the image of the television, my living room, the dancers and my cats striated into coruscating swirls of muted colors. I picked out one voice counting backwards. It was in the high thousands, and I remember being apprehensive about what would happen when it reached *one*.

I couldn't focus on this fear for long, though, because suddenly I found myself recapitulating the cosmologies and worldviews of Western civilization, much as I had when I was young. I was Ptolemaic as an infant, as most of us are, convinced that the earth, if not myself, was the omphalos of the universe. The contact with the forms of the physical world that being a toddler brought me led to my deriving the Platonic conception of the universe from direct experience: there is a doggie, that is milk, I am hiding under the piano that is all pianos. Being three and four made me the essential Thomist, using intuitive principles of logic and a rigid, irrational dogma to fight off having to take a nap. This development proceeded straight through high school, when my thoughts paralleled those of the Enlightenment, through my Nietzschean college days, right up to the present. I was so absorbed by the telescoping of our culture's intellectual maturation into the span of my own life that suddenly the voice was saying "Four. Three. Two." Then it said "One."

Instantly I was plunged into utter blackness. I had no sense of my mind or my soul, but was acutely aware of my body. Every cell of it, I realized, could be mathematically described. I became aware of a vast matrix, each row of which described the location of one of my cells as a set point in four-space and contained a fifth number that could only be itself a Godelized description of the construction of the cell itself. As I reverse-encoded these vast numbers, I extracted more and more information about the underlying structure of my corpus. I derived from this vast numerical fabric a huge yet, I think, ultimately finite algorithm which described the expanse of my soul and, I think, contained within it the moment of my own death.

What happened next is unclear. I seem to remember swimming somewhere, breathing the water as though it were air. I know that at one point I was soaring naked in the ridge lift over Tilden Park, following the movements of rodents on the ground below with great interest. I slithered through the underbrush on my belly. I bayed at the lights of the city below, my loins quivering with lust at some strange scent caught on the wind. Then I was lying in my kitchen, my skin flaky and bleeding from a thousand cuts and scrapes, shivering and weeping. I picked myself up, took a long shower, and went to sleep for two days. I woke ravenously hungry, and ate half a loaf of bread and a pound of vanilla yogurt, all that was in the refrigerator.

However, my cat's breath still stinks. What did I do wrong? ■

This is not an article, but an artifact. It is a book proposal I wrote in October 1989, for a book which will not be written, at least by me. Though the proposal won a nice advance from a New York publisher, I chickened out of the project, for reasons given shortly.

—SB

THEME

OUTLAWS, MUSICIANS, LOVERS, AND SPIES

The Future of Control

BY STEWART BRAND

WHY DOES NO ONE worry about our children's love of computers? Parents who usually reject invasive novelty in their kids' education are embracing computers in the schools and at home. Evidently they know that fluency in new forms of communications is a shortcut to power, that communication *is* control.

Corporations know the same thing. Going into the 1990s they are scrambling to comprehend the structure of the emerging information environment and take early competitive positions in it, knowing that whoever comprehends first and becomes fluent first shapes the environment for everyone else.

But a peculiarity of the new information environment is that it's seldom corporations who become fluent first. The tools of communication innovation are too widespread. Increasingly the real exploration is *pre*commercial — by invisible elites such as librarians, disabled people, programmers, black marketers, outlaws, musicians, lovers, spies.

Specialized subcultures like these grab new media and run with them, innovating headlong in the directions of their own desires rather than in the approved directions of commercial development. They're assisted by the continuing turbulence of the information economy. As the whole underlying technology of communications continues to advance and replace itself, infrastructure and markets refuse to settle down, and slow-moving large organizations remain at a disadvantage. The new information environment is a seething texture of constant surprise.

To corporate audiences I've been saying: "Information wants to be free (because of the new ease of copying and reshaping and casual distribution), *and* information wants to be expensive (it's the prime economic event in an information age) . . . and technology is steadily making the tension worse. If you cling blindly to the expensive part of the paradox, you miss all the action going on in the free part. The pressure of the paradox forces information to explore constantly. Smart inventors and marketers quietly follow."

This book is about how information explores, and how that changes the nature of societal control. The emerging communications process is simultaneously self-subversive and self-organizing, deeply at odds with our cultural and economic habits.

You could see the disparities at a meeting of AT&T strategic planners last winter. Rock musician Peter Gabriel was attending as a member of the Global Business Network, a research and consulting group I work with which had organized the gathering. One of the AT&T executives interested in intellectual property asked Gabriel, "What do you think of piracy?" Gabriel said softly, "I think of piracy as advertising."

Gabriel explained that piracy is an inducement for him to tour the world, where there is a huge paying audience for his concerts, thanks to the global black-market cassette traffic in his music. When he tours to places like southern Africa, he encounters local musicians and music which he soon incorporates into his own work. He and other stars like Paul Simon are able to bring a global audience to artists who before had only a regional following. Thus came "World Beat" music, which is binding the hordes of global teenagers into a single overlapping culture oblivious of national governments. The multi-billion-dollar world music business is being reshaped by its customers, in the face of strenuous resistance by the distributors but with the quietly subversive collaboration of the musicians.

Further disparities. At the same meeting I noticed that the AT&T people referred to their customers as "consumers" or "end-users." It seemed an odd way to think about information, so I mentioned that at the WELL, the computer teleconference system which I co-founded, we think of information customers as *producers*. They create nearly all the information on the WELL, and they actively shape the system. The more we let them do that, the more profitable our system becomes. By contrast, treating information customers strictly as consumers is leading the mass-market videotex system called Prodigy toward failure, despite (or because of) the $700 million sunk into it so far by IBM and Sears.

It's the difference between market research and customer research. In market research you estimate how many modems are in American homes and imagine what people might like to do with them. In customer research you examine what people actually do with rudimentary new media, and then you figure out how to improve the service and charge for it. Watch who grabs and redirects new devices like cellular phones, backyard satellite dishes, 976 numbers, e-mail, video cassettes, radio scanners, computer games, breath-driven keyboards, cyberspace tools, or the MIDI interface that makes any computer a sophisticated musical instrument. Watch where fanaticism leads.

What people actually do with new media is fall in love — with the new medium and with fellow enthusiasts. Like musicians they revel in complex new fluencies, delight in composing new works, and become artists, creating beyond themselves. As the rest of the culture lags behind, they find themselves ahead of the laws, limited only by what's possible rather than what's decreed. Like spies, they traffic in secrets, explore the hidden real structure of society, and influence events from behind the scenes. Often their unruly inventions become civilization's tools . . .

The emerging communications process is simultaneously self-subversive and self-organizing, deeply at odds with our cultural and economic habits.

• "Talking Books" for the blind from the Library of Congress led the way to the huge audio book market of today. Some devices that now reach directly into the nervous systems of the disabled will eventually reach into all of us.

• The origin of computers was in espionage — Alan Turing creating a machine to decrypt Nazi military signals — and signals intelligence now is exploring the subtle and vast uses of massive parallel processing to analyze and decrypt the very fabric of global communications.

• Sex unabashed and uncurtailed made France's Minitel system into the world's leading videotex success. Sex likewise is bound to toy with every new form of broadband communications — you can't catch AIDS through a fiberoptic cable. Systems that permit such traffic will grow and adapt faster than ones that don't.

One way to understand the new information environment is to watch for strategies that work in it. In recent years music distributors (*not* musicians) have fought a fierce holding action against the coming of DAT — Digital Audio Tape. They complain that of the annual $9 billion of recorded music in the US, only $4 billion is actually sold. The rest is home-copied — "stolen," says the industry — and DAT will make the situation worse, they say.

A gent named Charles Garvin took the trouble to study what home-copiers of music actually do. ►

What they do most of the time is recombine commercial material to suit themselves, fill whole 90-minute cassettes, and improve fidelity. So he founded a distribution company called Personics to improve on what the home-copiers were doing. The service is now rolling out in music stores nationwide. You go up to a "Listening Post," listen in headphones to any of 15,000 recorded cuts, combine them as you like, and pay at the counter. It is a blazing success. Garvin says, "Up to this point the industry's response to home taping has been to outlaw, tax, and otherwise legislatively discourage it. These efforts have dismally failed. Personics' approach is, instead, to treat the phenomenon as evidence of massive latent demand; to treat it not as an illegitimate product to be outlawed, but as a service to be provided."

Computer-enhanced communication makes the economy both more locally lateral and more global, both to the detriment of hierarchies such as traditional businesses and nations.

Piracy as market research; customers as album producers. Garvin watched where the music was exploring and quietly followed.

A similar strategy is evident in the coming of cyberspace — head-mounted display units giving the user active immersion in computerized "virtual reality." For years the military has been experimenting with multi-million-dollar helmet displays for fighter pilots. Mike McGreevy at NASA didn't have that kind of budget, so he looked for a low road, making a cyberspace rig out of off-the-shelf components, including some from Radio Shack. He widely publicized the work, published the details of his procedures, and waited for consumer electronics firms to crowd his door, which they did. As a result, the first commercial cyberspace toolkits and games will be available to the general public by next year, instead of 10 or 20 years later, coming from makers as diverse as Nintendo/Mattel and Autodesk. Amateurs will craft new worlds which will demand ever more capable cyberspace tools. We are entering a decade of designer realities.

In the electronic information economy, hierarchies are at a disadvantage that has nothing to do with politics. "Electronic Markets and Electronic Hierarchies" is the title of a landmark 1987 paper by Thomas Malone and colleagues which says, in summary, "By reducing the costs of coordination, information technology will lead to an overall shift toward proportionately more use of markets — rather than hierarchies — to coordinate economic activity." Computer-enhanced communication makes the economy *both* more locally lateral and more global, both to the detriment of hierarchies such as traditional businesses and nations. Inventive guerillas flourish in such times.

This is more than a different way to see the customer and the market. It's a different way to see the world and the very idea of control. Even the former "consumers" of national purpose in rigid hierarchies like China and the Soviet Union have begun to turn creative, in part because of a long history of failure, in part because of the new communications environment. At the same time, the loosening of national boundaries by information flow permits new large-scale groupings such as "Europe 1992."

The unraveling of the command economies signals a deep shift in how control works in the emerging communications structure. It's a shift from the dominance of hard, accountable control from above to soft, unaccountable control from below. "Control" is increasingly seen in the feedback sense — the innumerable tiny local adjustments that keep a market economy or an ecosystem resilient and adaptive. No one's in charge, but the system flourishes.

This kind of understanding has had a major boost from recent computer-simulation capabilities which gave rise to the study of chaos and "the sciences of complexity." At the Santa Fe Institute, for instance, a Citibank-funded study of "The Global Economy as a Complex Adaptive System" has taken off. A complete revision of economics is in process, resulting from the collaboration of economists, biologists, physicists, and computer scientists, some of them Nobel laureates. They've thrown out such basics as rational players, unlimited knowledge, and blind self-interest, and they're coming up with economic models that work for a change.

In the world of computer science, a revolution is under way as a dozen different subfields converge on what's called "emergent computation" — highly complex, highly parallel simulations that have "emergent" properties resembling life. No one's in charge, but the system flourishes. It flourishes on detailed local innovation, just as civilization now does.

From the very instruments of the communication and control revolution are coming the beginnings of a theory of it.

BOOK

SIZE: 80-90,000 words, plus footnotes and index.

FORM: Journalistic essay.

SCHEDULE: Research, 1990; writing, 1991. Delivery of finished manuscript, end of December 1991.

AUDIENCE: Primarily general public; plus general business, communications and computer business, and communications and computer academics.

The journalism is what should sell *Outlaws, Musicians, Lovers, and Spies* to the general reader — the sheer bizarreness, glee, and originality of the subcultures as they dodge authority to explore electronic sex, group virtual reality, global music, free data, penetration of all secrets, and full life without a working body or complete mind. The book is aimed at everyone curious about how culture evolves these days. The point is: *anyone* can play.

Rough Outline:

Preface

Chapter 1: World Beat

The world is a club that never closes for the current generation of musicians. Born instrumentalists, they are the first to seize, exploit, and reinvent new devices for performance and distribution.

Interviews for this chapter include Peter Gabriel, Brian Eno, Paul Simon, Todd Rundgren, Jerry Garcia, Bernie Krause, Charles Garvin, and whomever they lead to. A good cover photo might be the view from the control panel of Peter Gabriel's astounding studio with a British brook running transparently under it.

2: Singing the Body Electric

Caught between social pressures and the individual's drive, sex always explores. The story of sex in the success of French Minitel is often alluded to; now it is told in detail. Likewise the 976 saga in the US — the view from the other end of those $2/minute calls that repositioned the phone companies as an entertainment medium. Life and love on the Date-a-Base bulletin boards. And cyberspace hackers speculate on their sensuous frontiers.

Initial interviews: Albert Bressand (leading French information economist), Jaron Lanier (prime visionary and inventor of cyberspace tools); the Mitchell Brothers (cheery San Francisco porn producers and distributors).

3: Independent Living

Crip power: intense motivation from the disabled, generous ingenuity from the engineers/inventors, and design problems at the heart of the human mind/body add up to routine breakthroughs that eventually enable us all. Mute Stephen Hawking transformed into a riveting public lecturer via his personal computer is a mild, visible example of what's coming.

Initial interviews: Center for Independent Living in Berkeley; Mark O'Brien, author of "How I Became a Human Being"; Chuck House (Hewlett-Packard VP who is investigating what makes the "functionally illiterate" function so well).

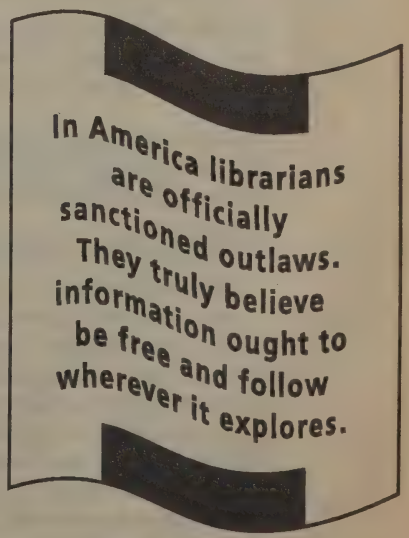
4: All Librarians Are Radicals

The only communicators taking *full* advantage of the electronic convergence of all media are the librarians, who owe allegiance to no single industry. In America librarians are officially sanctioned outlaws. They truly believe information ought to be free and follow wherever it explores. They now call themselves "information scientists," and they are.

Initial interviews: James Billington, present Librarian of Congress, who recently wrote to me; Daniel Boorstin, previous Librarian of Congress and author of *The Discoverers*; Eric Drexler, expert proponent of "hyper-media."

5: Reprogramming Civilization

If Steves Jobs and Wozniak had been thrown in jail in 1972 for selling "blue boxes" (which gave free access to the world's phone system), the competitive advantage given the US by the personal computer revolution would have been set back ten years. Now that all communications forms are computerized, programmers are designing the world's information infrastructure, and they know it. Salient fact: most programmers are libertarians.



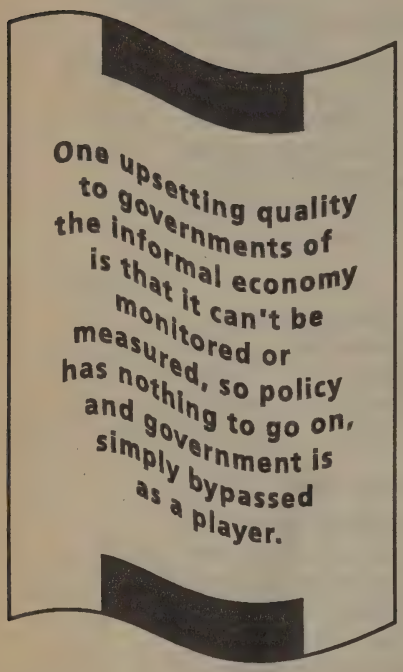
Initial interviews: Jobs and Wozniak; Captain Crunch; Russell Brand (no relation, author of *Attack of the Tiger Teams*); Marc Porat; and others whose names are unfamiliar or will be protected.

6: SigInt

Until recently the National Security Agency succeeded in limiting the effectiveness of encryption devices available for

private use. That's now breaking down. Meanwhile amateur industries are emerging around such things as using "scanners" to eavesdrop on cellular phone calls. And there's the "chippers" — right-wing hackers (!) who reverse-engineer and privately peddle microchips that defeat satellite TV signal scrambling. When the world is mostly communications, and no communications are secure, what is that world like?

Initial interviews: the deviser of "public key" encryption systems, now at MIT; the chap at Xerox PARC who released an NSA-disapproved encryption scheme into the public nets; Donn Parker, the computer security expert at SRI International; some retired spies.



7: Grey Markets

From Peru and South African townships to Italy and the Soviet Union, grey markets are the salvation of tottering economies. In robust economies like the US the information market is permanently part grey, and it's the most innovative part. Even scientists have their "grey literature" (papers passed around informal networks before publication). One upsetting quality to governments of the informal economy is that it can't be monitored or measured, so policy has nothing to go on, and government is simply bypassed as a player (that's the whole idea). With constantly new information technology, the future is: ever greyer markets.

Initial interviews: Peter Schwartz; Albert Bressand; Hernando de Soto, author of *The Other Path;* Esther Dyson; Tom Malone.

8: The Costs of Getting It Wrong Big

"Quick is beautiful," says Freeman Dyson. Most megaprojects are doomed in the turbulent information environment. The series of videotex debacles, soon to culminate with Prodigy I expect, is testimony to expensive corporate habits of top-down marketing in a bottom-up world. A giant like IBM, which made a last brilliant surge with the adroitly imitative PC, can only watch in horror as upstart companies like Thinking Machines, Tandem, Apple, and Korean clone-makers crowd it out of the market. While media mergers like Time and Warner are exploring new levels of diseconomies of scale, job-shops like Colossal (film and video) devolve profitably into an array of tiny scattered production units.

Initial interviews: Ted Papes, CEO of Prodigy; Alex Singer, Hollywood director; Mike McGreevy, NASA; Lawrence Wilkinson, head of Colossal.

9: Auguries of Emergence

The diverse pioneers of computer science are converging on "connectionist" breakthroughs which will provide the body of theory and practice of communication and control in the '90s. "Emergent computation" is as rich as reality and as full of surprises. It is already transforming economic theory, which is coming to resemble ecology. In the next decades such computation will merge with every level of human activity from the individual to the global.

Initial interviews: Danny Hillis, inventor of The Connection Machine; Doyne Farmer, deviser of the "rosetta stone" of connectionist disciplines; Kenneth Arrow, Nobel economist; George Cowan, head of Santa Fe Institute.

10: The Future of Control

. . . is unknowable, but some trends are evident. Specific questions can be framed now, specific signals watched for, specific scenarios explored. The concept of control is dividing into top-down and bottom-up, with grass-rooted, fine-grained, ecological-style, bottom-up control in the ascendance. Markets are replacing hierarchies — not entirely, but enough to change everything. In such a working environment anyone can invent in the mode of outlaws, musicians, lovers, and spies.

Initial interviews: Catherine Bateson, lifelong student of the two forms of control; James Beniger, author of *The Control Revolution;* Mary Douglas, author of *How Institutions Think.*

Footnotes

Extensive, almost a parallel text, with detailed access to useful sources.

Index

EPITAPH

February 1990

I WANTED THIS BOOK to exist — still do. I would love to have written it. But as the prospect of actually researching the thing approached, I became pinched with dread. My reasons for not doing the work may be someone else's reasons for taking it on.

For me it all just seemed too broad, too laborious, too slippery and fleeting, too crowded, too sequential, and not necessarily useful.

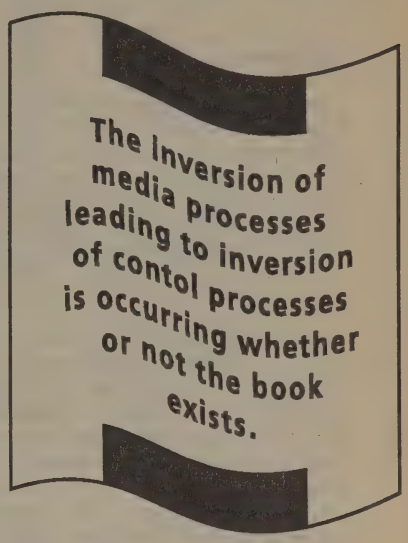
Broad and laborious. I was looking at having to become familiar with the core and the cutting edges of fields as diverse as world music, espionage practices and prospects, library science and fantasies, the universe of the disabled, the covert and overt explorings of sexual pioneers, and whatever the next generation of hackers and computer scientists is up to, meanwhile keeping up with the exploding domains of communication technology. Such toil needs the stamina and single-mindedness of an author younger than I.

Slippery and fleeting. My book about the Media Laboratory at MIT is still timely, four years after I researched there, thanks to the slow, deep pace of academic endeavor. But the scintillating grassroots activity that *Outlaws, Musicians* wants to report on is bound to be out of date by the time the book hits the street — much as Whole Earth discovered years ago with its *Whole Earth Software Catalog*. The thesis of the book might continue to be germane, but the news the thesis was built on would yellow rapidly.

Crowded. Many of the writers I am most interested in and friendly with are deep into book projects that impinge closely. Howard Rheingold is doing a book on Virtual Reality, and so is Jaron Lanier. Stephen Levy is doing a book on Artificial Life. John Markoff from the *New York Times* is doing a book on Computer Crackers. My Global Business Network colleague Peter Schwartz is doing a book on global strategy, *Thinking Ahead*. It would be enjoyable to read and cite their works-in-progress, but the fact is I would be confronted with daunting competition and the prospect that my book could wind up with only niche significance. If so many others are covering pieces of this field, it's probably covered.

Sequential. Author writes a book. Author is invited to travel about and give talks based on the book. In the process, author learns quite a bit more about the subject, which is reflected in the talks. Eventually that material crystallizes into a new book proposal, which attracts money the way sequels do, and two years later here comes author bobbing by on the same old merry-go-round, slightly different-color horse. A few rounds of that and author starts to look like an image self-copied toward artifacted caricature. I've written two books about information artisans — *II Cybernetic Frontiers* and *The Media Lab*. That's enough.

Useless. Suppose *Outlaws, Musicians* were a success. It wouldn't make much of a difference in the world. The inversion of media processes leading to inversion of control processes is occurring whether or not the book exists. My drawing attention to innovation by lovers, spies, etc. would, if anything, hamper their activity and subversive effectiveness. The book is observational and interpretive; it has nothing to recommend. No program. (Except maybe this: libraries are major crafters of the emerging information infrastructure — infostructure. Throw respect and money their way and you'll never be sorry.)



All these reasons may be specious. I detail them mainly because it's rare to hear explanations of why something *isn't* done. The motivational fact of the matter is that I was looking through this book project toward one I really wanted to do. Printing this book proposal is part of a lazy shortcut. If I publish the proposal, I can act as if the book is done and move on. (I wrote another proposal, of sorts, got an advance, and am proceeding happily with *How Buildings Learn: And Fail to Learn*, due from Viking in a couple years.)

The several years of notes and references I accumulated for *Outlaws, Musicians* I am turning over with vast relief to Kevin Kelly, who has been gestating a book on information longer than I. He has the eagerness for the task and an originality of viewpoint that I now lack. Frequently he'll report some insight or gossip from the info biz that I thought I already knew about until his perspective changed the item into deeper news. Between his book and mine, I'd rather read his, and can't wait. ■

ADDENDUM

The elfin godfather smiles warmly, unshackles the dazzling gift from his swollen ankle, wipes his brow and says "Whew, that was close. You mean you've never tried one of these? You can see into the future with it. Here — ," then dances off in glee. Looking to the future is easy, but explaining the future induces dread in anyone rational or responsible. It definitely calls for youth. I'm actually kinda old myself (38). I'm headed toward taking a sabbatical next fall, and if I'm feeling cocky, I'll try something crazy along these lines. This book proposal is being published in this magazine because it is a project up for grabs.

—Kevin Kelly

Echoes from readers back to *Whole Earth Review* (27 Gate Five Road, Sausalito, California 94965)
We pay $15 for every letter we publish.

Inexpensive Japan

I have lived in Japan since April '88. I teach English there. Of course there are many other opportunities once you have a chance to look around (which I've done). Anyway, I thought that your article ["Teaching English in Japan," *WER* #65, p. 72] was basically OK but it helped perpetuate at least one myth that is basically unfounded — the high cost of living.

I am currently visiting friends and relatives in the US after a 4 year absence and personally I'm appalled at the high cost of living in the U.S.!!! I believe that I live cheaper in Japan than I would here. My wife & I live in Nagoya, the third largest conurbation in Japan. We have a two story house which we pay about $425/mo. rent for. We are vegetarian so most of the staples in our diet (e.g. tofu, in season vegies & fruits) are lower than the US, others are the same or slightly higher (dairy products) while only rice is way out of line. Most home furnishings including stereos, kitchen stuff etc are free (from the ample piles of garbage) or cheap (purchased second hand from foreigners who are leaving). Bicycles are cheap or free. Most companies supply you with a transit pass between home & office which you can use for your own private purposes as well. And the list goes on.

I think the Expensive Japan syndrome comes from the elite business & diplomat corps who can't or won't adapt to the local scene. It is also often based on Tokyo experiences. Any idiot could expect higher prices in primary cities. Try New York, London, Paris, Mexico City, etc. They are all above the norm. Get the picture?

$700 phone installation? Where? Tokyo? Maybe. In Nagoya you must buy a bond worth about $450 to get a phone installed. It is a surety against your skipping out. It can be resold when you leave with no problem. A friend of mine (Japanese) who just got married & disconnected her phone is loaning me her bond gratis.

For someone to spend a couple months jobless is ridiculous. They must not want a job very bad.

"Key money" is much more than what you state & the number of months in advance varies from 0-10. It is really three things — gift money, deposit, payment to real estate agent & 1st month's rent. The deposit part is refundable.

You forgot to mention a more important though more difficult source for job listings — International Exchange Centers located throughout Japan have the best *local* listings. An example from my area — the Nagoyan International Center has a board bristling with job opportunities, mostly local, that are never advertised anywhere else.

The visa situation is unlikely to be properly explained by the consulates as each office in Japan interprets things a little differently.

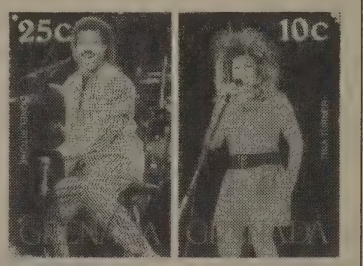
The college diploma is more for easing your visa through immigration than for the school.

George Crane
Nagoya, Japan

Tipi, Inc.

In 1970 I talked to j.d. smith and Stewart Brand and told them I wanted to make a good quality, lowcost Indian tipi and did they think it would be worth the effort. They felt that we would be needed for about 2 yrs. and would probably make between 100-200 tipis before the interest stopped. It is 1990. We have now made more than *9000* tipis and grossed over $6,000,000. I don't think any of us can afford to prematurely decide the value of any activity or field of inquiry. To make or imply value judgements about consciousness is to totally underestimate the immensity of the phenomenon of life.

Jeb Barton
Nomadics Tipi Makers
17671 Snow Creek Road
Bend, Oregon 97701
(503) 389-3980



Global Teenager stamps from Grenada?

Partial Earth Channel

This is maybe a partial answer to Ben Bochner's letter in *WER* #66 (p. 138), asking about a "Whole Earth Channel." It does exist, but requires a little extra in the way of gadgets.

I have been looking at earth images from GOES satellites for over a year now via my shortwave receiver and my PC, with a little help from some software written especially for the task. Here in the east, I tune in to any one of the frequencies that are clearest, depending on the time of day. Whole Earth images are transmitted twice a day at 9:00 am/pm, EST, and other more localized images are transmitted eight times daily within a regular schedule. These are western hemisphere photos only. If you have EGA or VGA color with your PC, these images are quite wonderful, and occasionally dramatic, what with the odd hurricane every now and then.

The company that makes the software also has a combination receiver/software package that will pull in a fresh image every ten minutes direct from the GOES satellite. I don't have this as of yet, but it would certainly beat the second generation copy problems that you sometimes encounter with the shortwave broadcasts. Occasionally, the boys who feed the pictures on shortwave seem to be asleep, and miss an image or two.

PC HF FACSIMILE 4.0: Software Systems Consulting, 150 Avenida Cabrillo/Suite C, San Clemente, CA 92672; (714) 498-5784.

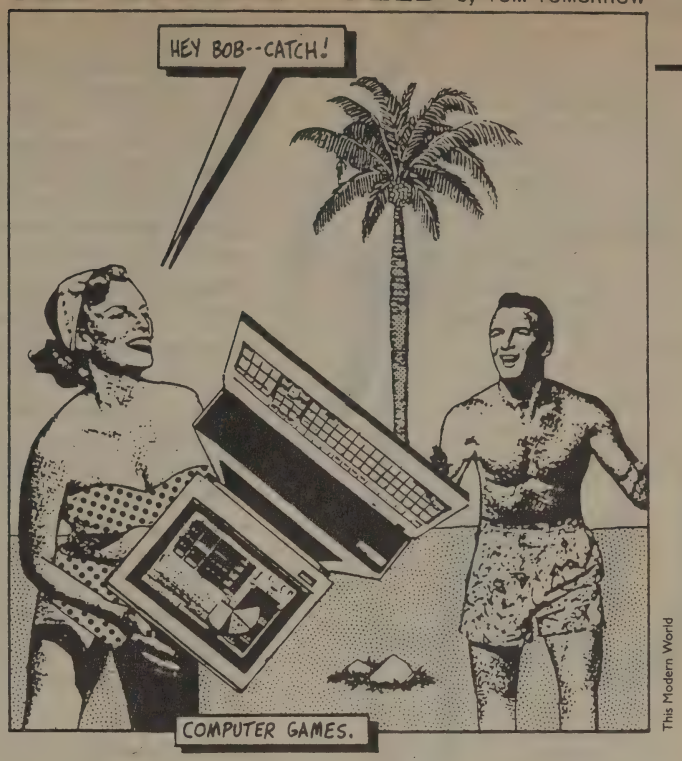
Don Mussell
Whitesburg, KY

The holy data suit

I am still mulling over the contrast between Lanier's Virtual [*WER* #64, p. 108] and McKenna's Psychedelic [*WER* #64] Reality. There are some profound points of contact and departure having to do with remembering and forgetting, risk and suffering.

Virtual Reality appears to be a sort of fractal incarnation, or perhaps a reentrant subroutine, wherein a center of awareness (soul, if you will) dons a more or less confining set of circumstances and proceeds to go about its business as though the situation was real. In this new setting, a new body could be formed, and the process repeated. So it appears that we have bodies of all sorts: the mystical body of Christ, the body of Gaia, light bodies, human bodies, and now the data suit. The point is that the process is interesting when the way back is forgotten, at least momentarily. As Donald Fagen has recently sung, "We suit up for another game, the name of which we used to know." Even the prosaic video game parlor sees many a bizarre incarnation.

My concern is that Virtual Reality may not have the juice to be a transformative medium. While an artistic tool useful for researching meta-linguistics is a noble goal, it may not be saved from becoming entertainment, a sort of 4-D mouse. It would seem to be a neutral technology for increasing empathy, being subject to the intent of the user. (In this way most things are neutral.) While psychedelic compounds of all sorts have been similarily turned into mere habits, the chemical realm remains one of "authentic risk," having more than enough juice to expose one to suffering as well as ecstasy, and in this holds the potential of transformation. Even as I hope for



a way to grow without growing pains, it seems risk is needed. There is an Eskimo shaman Igjugarjuk who said that true wisdom "lives far from mankind, out in great loneliness, and can be reached only through suffering." Avoid the deadly underdose.

It seems that although the Virtual Body could be immortal, owing to the superior longevity of hardware, the animating awareness would one day fail to log on (die) and would thus pop the stack, so to speak. A new stand-in could take over the virtual body left behind and carry on. This brings up the question of the existence of a virtual entelechy. More likely, the uninhabited data file could be placed in a museum of history to be inspected by newcomers.

Given my druthers, I tend to avoid hardware any more. I rest assured that all the mutability and transformation I can handle lie no further than the nearest cowpie, and possibly closer.

Alastair Couper
Hana, HI

No phone card security

I recently came across a very major security problem when using private phone systems such as in hotels.

Most of these have a Station Message Detail Recorder (SMDR) which keeps track of all digits entered at your extension. At check out time these numbers are compared, either electronically or by hand, with a rate chart and the bill gets calculated.

Since I generally use alternative common carriers for long distance calls, I almost always have a local, free (950) access number.

Recently, one institution tried charging me excessive amounts claiming that I had accessed some of the other, ahem, special exchanges (anything above zero is wrong, but I'll grant them the 25 cents if they insist) so I asked to see the printout.

I discovered, to my very major dismay, that the paper had the (950) calling number, AND my security code, as well as the final exchange dialed.

On checking further, I discovered this is not only a common feature of SMDRs, but is ALSO ON MANY (private) COIN PHONES!

Very curious, and very worrisome.

I found a way to (sometimes) get around this. Most of the listings are limited to 20 or so characters, so I will punch in some random characters, and hit the octothorpe for a re-order. That way, the hotel printout merely gets the first, defective, series.

This problem certainly raises some curious questions . . .

(I also sent this letter to *2600 Magazine*, and am sending modified versions of it to Public Service Commission, FCC, etc. Wonder what the Electronic Communications Privacy Act would say about this???)

Danny Burstein
Flushing, NY

Juicy conspiracies

I want to suggest that you devote one issue to *Conspiracy*. As economic situations seem to tighten here in the midwest the old conspiracy ideas seem to be cropping up again. The "Eastern Jewish Bankers", Rockefeller's, Tri lateralists all seem to be topics that are more discussed in public.

I think you have the resources to cover a lot of conspiratorial ideas. Start with a historical background that would trace some of the major veins. You covered briefly some of the sources in "Fringes" [*WER* #52] but you missed some great ones.

There have been some great books on:

economic monopoly/conspiracies:
—*Merchants of Grain, Seven Sisters*
conspiracy of silence:
—*Heartland* by Mort Sahl
fiction/guidance
—*Nine Unknown* by Talbot Mundy
drug/government
—*Underground Empire*
religious/underground
—*Cults That Kill* by Kahamer
religious/conspiracy —*Planned Deception* by Constance E. Cumbey
& then there's the . . . "Gemstone File"

I keep remembering something I read by Robert Anton Wilson about how, when he was Playboy Advisor, it got real hard to sort out the crazies from what was really happening.

I don't want to leave out Christic Institute, Mae Brussel, Critique, or the Covert Action Information Bulletin. A great academic investigation was published: *Conceptions of Conspiracy* by C.F. Graumann & S. Moscovici, Springer-Verlag, NY 1987. And then, of course, what ever happened to IRA EINHORN? Try to stay away from assassinations or it becomes unfun very rapidly.

Mark Esping
Lindsborg, KS

[Steven Levy, author of Hackers, *wrote the definitive account of conspiracy victim — and former contributor to this magazine — Ira Einhorn in* The Unicorn's Secret *(1989, NAL/Onyx, $4.95).* —*KK.]*

Forever reliable

Once, I believe on your recommendation, I requested a catalog from Reliable (office products), 1001 W. Van Buren St., Chicago Ill. 60607. 1½ years of requests to get *off* their mailing list has done *no* good. Maybe you'd care to tell your readers? Any advice?

Sheldon Drake

Corrections

*In case you've tried to reach International Medcom for the Rad Alert (*WER *#65, p. 104), the correct number is 707/823-0336.*

From the Forest to the Sea *(*WER *#66, p. 48) is $15 postpaid.*

National Wetlands Newsletter *(*WER *#66, p. 62) can be reached by writing to 1616 P Street NW, Suite 200, Washington, DC 20036, or calling 202/328-5150.*

Man of the Trees *(*WER *#66, p. 131; the book, not the video) costs $14 postpaid.*

*Wire Gripper/Maasdam, Inc. (*WER *#66, p. 81) has a toll-free number: 800/366-7855.*

*And the photographs in "Confessions of a Treehouse Dweller" (*WER *#64, p. 66) were taken by Laura Ewig.* ■

UNCLASSIFIEDS

The UNCLASSIFIEDS are a reader-to-reader service available to *WER* subscribers only. They're designed to provide a cheap communications network for *WER* readers and mild financial assistance to the magazine.

UNCLASSIFIEDS are a great way to reach, survey, educate, link up with fellow *Whole Earth Review* readers. Send us your words, ideas, product descriptions, thoughts, messages . . .

TO ADVERTISE:

- **You must be a current subscriber.** Please send a current mailing label (or copy) from the cover of *WER* when you send in your ad copy. You may become a subscriber when you place your ad. *WER* subscription rates are $20/year ($24/year foreign and Canada). Please add this amount to your payment if you are not currently a subscriber. Order forms for subscriptions are at the back of the magazine.
- **Rates are 75 cents a word.** You count them and send us payment with copy. We will not bill. Payment must accompany the ad and be in U.S. funds drawn on a U.S. bank.
- **The first few words in your ad will be in capital letters.** We cannot do any other words in capitals.
- **To run a repeat ad:** Multiply your ad payment times the number of issues in which you want the ad to run. Send in that amount and we will print the same ad that many times. If you decide to repeat your ad after it has run, or if you wish to make a change in the copy, you must submit the ad again.
- **Deadline** is June 27 for the Fall '90 issue, September 28 for the Winter '90 issue, January 7 for the Spring '91 issue, and March 30 for the Summer '91 issue. Sorry, we will not take ads over the phone. Ads received after deadline will be held for the following issue.
- **We print ads in the order received.** "UNCLASSIFIEDS" means "no categories."
- **Mail ad and payment** (made out to *Whole Earth Review*) to: Susan Rosberg, WER UNCLASSIFIEDS, 27 Gate Five Road, Sausalito, CA 94965.

WHOLE EARTH REVIEW is looking for a Production Manager. The position requires a flair for organizing and managing people, paper, printers, schedules and deadlines. Applicants should also be proficient at proofreading. This job is a little over half-time with 2-3 weeks off every 2 months. Call Lori at 415/332-1716 for more information.

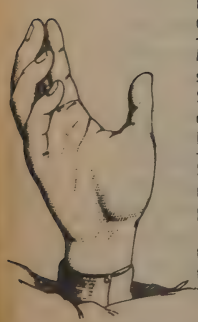
RECORDS, CASSETTES, COMPACT DISCS! New free discount catalog with over 10,000 titles. Bluegrass, folk, blues, jazz, old time country, and much more, listed by category of music and by artist. Elderly Instruments, 1100 N. Washington, POB 14210-BJ30, Lansing, MI 48901 (517) 372-7890.

ADVERTISING WORKS when you reach the audience that needs your products or services. We specialize in placing ads for healthy, enlightening products in several progressive national magazines. They run the gamut from *Yoga Journal* to *Mother Jones* emphasizing environmental issues, spiritual practices, and holistic health education. Our services are free, but alas, not the ads. GPR, 2054 University Ave. Ste. 302-R, Berkeley, CA 94704. (415) 548-1680.

CARETAKER WANTED for remote property in northern California. Free rent and small monthly stipend in exchange for work. References required. Inquire c/o Fuller, 2139 Yale, Palo Alto, CA 94306.

60's STYLE BLUESROCK CASSETTE from the heavyweight champion of rock 'n' roll, Mister Guy. $7 payable to Third Eye Records, P. O. Box 385, Cheltenham, PA 19012.

THE TRUTH That Will Make You Free. Ultimate spiritual knowledge. Free booklet! Peter Crames, Box 1023-WER, Cambridge, MA 02238.



MOBILES FOR THE OUT-OF-DOORS. Brass, stone, and fishing swivels; write me for a flyer. $90 and up (mention WER); tiny to tremendous. Hank Roberts (Mobiles), P. O. Box 231, Berkeley, CA 94701; 415/843-8639.

STINKY FEET? Simple home procedure eliminates and prevents reoccuring foot odor. No powders or charcoal pads. Guaranteed to work. For info pac send $5.00 cheque or M/O & SAE to Clear The Air, Box 1435 Stn. B, London Ontario Canada N6A 5M2

THE BEST BUSINESS BOOKS, recomended by Whole Earth, are available from Bell Springs Publishing, Box 640-E, Laytonville, CA 95454. Write for free catalog.

INSTANT DOMES: 20 minutes up! Proven performance. Many models. Catalog $1. Shelter Systems, P. O. Box 67-W, Aptos, CA 95001

WINDS OF CHANGE issues wanted (1979-81) Carl Richter, 64 Anderson, N. Babylon, N.Y. 11703

HATE YOUR JOB? Discover new work options, alternative careers, home business opportunities. Trial subscription, $1. The Whole Work Catalog, Box 297WER, Boulder, CO 80306

THE INTERNATIONAL SHAKUHACHI training center is soliciting input from shakuhachi enthusiasts outside Japan. Especially welcome are original compositions involving shakuhachi, requests for teachers and/or performers and individuals and groups studying or wishing to study shakuhachi playing in Japan or abroad. The International Shakuhachi Training Center, 2-16-5 Eifuku, Suginami Ku, Tokyo, Japan 168

BENT MY EAR to hear the tune
And closed my eyes to see.

HOME BUSINESS POSSIBILITY — Picturesque retail building, comfortable house, and practical barn, all surrounded by forest service land, in a rural Oregon coast highway tourist area. We've sold/made toys here for 15 years. For brochure call (503) 753-3593.

DIDJERIDU — American crafted didjeridu. Play this powerful aboriginal wind-instrument yourself. Instructional cassette included. $85. Fred Tietjen 26 Allen St., San Francisco, CA. 94109 415-474-6979.

HOW TO PREPARE for the coming depression: A Workbook for Managing Your Money and Your Life During Economic Hard Times. By Mark Friedman. Send $11.95 + $2 postage to NUCLEUS Publications, Rt. 2 Box 49W, Willow Springs, MO 65793. (417) 469-4130. Free Catalog.

UNDERGROUND ZINES, orgone, translations, mail art, autofiction, conspiracy, film, situationist, directories, glasnost, spec-tech, imported (UK, Australia) periodicals, books, pamphlets. Catalog $2: Flatland, Box 2420, Fort Bragg, CA 95437-2420.

FLY AGARIC MUSHROOMS. Amanita Muscaria. Wasson said it was Soma. Allegro said it was Jesus. 30 dried grams red var. muscaria grade A: $60.00. Grade B: $50.00. Red/orange var. flavivolvata grade B: $40.00. Other variations and grades available. J.L.F. P. O. Box 184-W, Elizabethtown, IN 47232 (812-379-2508).

NATURIST FAMILY VIDEOS/magazines, $2.00, S.A.S.E.; NATPLUS-WER, Box 9296, Newark, DE 19714-9296

BAMBOO SHAKUHACHI FLUTES, transverse flutes. Beautifully crafted, affordable. Catalog $1: Bamboo Music, Ken La Cosse, 2267-W 45th Ave., San Francisco, CA 94116

FINE WOODEN KITCHEN UTENSILS featuring California madrone; eastern bird's eye maple. Free catalog. Windhorse Woodworks 23853 Eastside Rd. (B) Willits CA 95490

TILL WE ALL FALL DOWN, it'll do you fine,
Don't think about what you left behind.
The way you came or the way you go,
Let your tracks be lost in the dark and snow.

GROUP MARRIAGE: Learn the latest. Send $7.95 for new book (plus $1.50 postage). Quarterly newsletter $9/yr. PEP, Box 5247-WE, Eugene, OR 97405.

NEED EXTRA CASH? Self-employment guide describes over 200 companies that need your help! Call 24 hrs. for details. (417) 868-1331

ORIGINAL MUSIC: Real world music from Cajun to Cantonese, salsa to spirituals, dumbek to didjeridu. Customers say our selection, service and knowledge are unequaled, our catalogue a true learning experience. We thank them, and keep trying to do better. Catalogue $1 from Original Music, Dept WE, RD1 Box 190, Tivoli NY 12583.

BOOKS ON NONVIOLENCE, Anabaptism, Quakers, early Christianity, simple lifestyle, and communal living. Many of these books are discounted — up to 50% off in our free catalog. Seekers Catalog, Rt. 19, Box 890E, Tyler, TX 75706.

VONNEGUT & ME. That's right! An 8X10 glossy of me . . . and, yeah, Kurt Vonnegut. Thrill to the juxtaposition of nobody with somebody by sending $6.00 today — return postage on me. Send to — Fairleigh Brooks, POB 6133, Louisville, KY 40206

JAPANESE ZEN BAMBOO SHAKUHACHI flutes. Beginners Shakuhachi US $245 air postpaid. Includes English playing guide, cassette tape, mouthpiece cover, cleaning cloth. Suitable for use at the International Shakuhachi Training Center. Complete catalog of shakuhachi flutes, 200 recordings, books, paraphernalia, study in Japan. US $3 refundable with order. Bei Shu Shakuhachi, 4508 Ikuta, Matsukawa Cho, Nagano Ken, Japan 399-33.

SONOMA COUNTY, California, realtor loves to find or sell homes for clients practicing right livelihood. I have market, construction, and money knowhow, and I listen. I'll donate $250 of commission to the nonprofit group of your choice. Marlene Lily, Willow Creek Properties (707) 578-7300 (office) (707) 578-3499 (home).

SOUTHERN OREGON wooded 5 acres with 3 cabins, workshop, garden, gazebo, creek, easy access. $45,000. Webb, 6317 Failing, West Linn, OR 97068. (503) 650-5005.

COMPUTER SUFFERERS! Ott Full Spectrum Radiation Shielded Light Systems, invented by world-famous photobiologist, Dr. John Ott, helps to relieve eyestrain, headaches, irritability and fatigue by counteracting electromagnetic radiations emitted by VDT screens. Call: 1-800-234-3724 or 805-564-3467

HEALTHY FULL SPECTRUM light by Dr. John Ott. Call 1-800-234-3724 or 805-564-3467

NEW ZEALAND Babycare Lambskins, warm in winter, cool in summer! Specially sanitized and safe, even for your newborn. Years of comfort for only $59.00 +$3.00 postage and handling, or send for free brochure. Anderson Distribution, HCR 5, Box 159 Priest Lake, ID 83856 or call (208) 443-2878.

THE WALL IS DOWN! Dramatic changes in East Germany mean substantial profits for the 'little guys' in U.S.A. 30 page comprehensive report contains demographics, regulations, cultural information, plus addresses, phone numbers of all Newspapers and Periodicals and much more! Send $25 to Markets International, P. O. Box 4416, Fort Smith, AR 72914.

GNOSIS MAGAZINE #16 (The Journal of Western Inner Traditions' Summer '90 issue) due out in July. Theme: Orthodoxy. Issues #1-15 available. Edited by Jay Kinney. Back issues: $5 each. Subscriptions: $15/4 issues ($20 for Canadian & foreign subs). Checks drawn on U.S. banks or Int. M.O.s to: Dept. W, The Lumen Foundation, P. O. Box 14217, San Francisco, CA 94114.

WHOLESALE VITAMINS AND MINERALS Highest quality available. Sold by Dr's. to their patients at twice the price. We sell directly to the public as low as 60% off retail. Thats less than Dr's. pay! These supplements are fresh! Write for free catalog. Preventic's Inc. 6300 Main #507, K.C. MO, 64113 or call our free Health Help Hotline 800-888-4866.

THE LAND NEWSLETTER — buying, selling and sharing land with respect. Special opportunities, upcoming events. $10/year. POB 849-w Glen Ellen CA 95442

HOW TO PROTECT your personal and financial privacy. A how-to manual for legally avoiding both corporate and governmental privacy invaders from libertarian and Christian perspectives. Includes info on beating lie detector tests, drug tests, securing your home and much more. $24.95 from LPP, Ltd. 1000 E. William St., Suite 100, Carson City, NV 89701. Credit card orders only, 800/642-0800 ext. 181.

WORLDWIDE ENGLISH NEWSPAPERS and Magazine-of-Month Club. 65 countries! Sampler 3/$2.98. Free brochure. Multinewspapers, Box DE-WS, Dana Point, California 92629.

"THE FUTURE'S HERE, we are it — we are on our own." Apply Fuller's synergetics.

CARETAKING AND ENVIRONMENTAL positions and situations — Information Exchange. The Caretaker Gazette, Box 342-W, Carpentersville, IL 60110. Send long SASE for free information.

BUY SAFER® WHOLESALE & SAVE! Only one case minimum. Since 1987. Non-Toxic Flea Soap for Cats, Dogs, Puppies, Kittens. Safer Insecticidal Soap Concentrate, & more. "Scanmask" beneficial predatory nematodes. Catalog $1.50 refundable. Dealer Inquiries Invited. Odessa Natural Enterprises (O.N.E.), Dept. 105-3, Post Office Box 537, Odessa, FL 33556-0537; (813) 920-4477 Until 9 PM Eastern.

TIMOTHY LEARY'S FLASHBACKS: A Personal and Social History of an Era is now an interpersonal software program. Perform this book! Match your reactions with those of the author or your friends. Requires IBM-PC or compatible, $29.95 to Futique Software, 5000 Santa Rosa Road, Suite B-112, Camarillo, CA 93012

"THANKS FOR AN ENTERTAINING AND important work. . . . I felt I had lived with you." —Timothy Leary. *The Long Watch* $13.45 ppd. Call or write for free brochure. Spiralling Books, 12431 Camilla St., Whittier, CA 90601, (213) 692-2198.

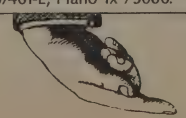
AROMATHERAPY CATALOG! Large selection of 100% pure, natural essential oils for specific remedies, perfumes, shampoos, masks, baths, massage and more with many helpful hints and recipes. We also carry a wide range of literature, posters, accessories, incense, teas and much more! Send $1.00 to: Wise Earth Botanicals 185 Cottini Way Santa Cruz, CA 95060

SAVE MONEY ON SOLAR! Large selection of products for solar electric, hot water, hydropower. Complete systems. 88-page catalog, $4.00. Integral Energy Systems, 105-W Argall Way, Nevada City, CA 95959. (916) 265-8441.

PENPALS IN 156 COUNTRIES, matched by age, interests. Send SASE to International Pen Friends, Box 3697-WER, Santa Rosa, CA 95402.

NEW COMMUNITY of scenic wooded homesteads. Extensive common land, skills matching for collaborative projects. Rural southeast Ohio, near cities, colleges. Paidela, Box 122, Athens, Ohio 45701

MEN ATTRACT WOMEN! Discover the power of K2rysma, a scientifically verified sexual pheromone, androstenone, that scentuously lures women to you like wild! Have the real chemical, biological passionate advantage. European import, 80 gram aerosol spray. Complete instructions and free documented report also enclosed. Guaranteed — period. Other men are using it, shouldn't you? Then rush $27.95 plus $2 shipping to: XTZ Products, P. O. Box 867461-E, Plano Tx 75086.



WHATEVER YOU'RE LOOKING FOR I can find. Free brochure. Design Research, Dept W, POB 1503, Bangor, Maine, 04401

LIVING FREE newsletter. Forum for debate among freedom-seekers, homesteaders, survivalists, libertarians, anarchists, outlaws. Lively, unique. $8.00 for 6 issues, sample $1.00. Box 29-WER, Hiler Branch, Buffalo, NY 14223.

HOW TO END THE DROUGHT. Send SASE to ALF, 2009 Morehead Ave, Durham, NC 27707-1029.

ALTERNATIVE COMMUNITIES across North America welcome visitors/potential members. Live in the country with others who value equality, ecological responsibility and nonviolence. For our brochure, write: Federation of Egalitarian Communities, Appletree, Box 5-WER, Cottage Grove, OR 97424. Free ($2 appreciated).

THE WELL (Whole Earth 'Lectronic Link): If you have a computer and modem you can be part of a unique community of people that meets online. The Well is divided into conferences that discuss just about anything you can think of. Mind, work, sexuality, Grateful Dead, and parenting are just a few. The rates are $8/month plus $3/hour for online time. Call 415/332-6106 for online sign-up, or 415/332-4335 to talk with a human being.

GOLDEN THREADS. Contact publication for Lesbians over 50 (and younger). World-wide. Sample mailed discreetly, $5. OR send SASE for free information. Box 3177, Burlington, VT 05401-0031.

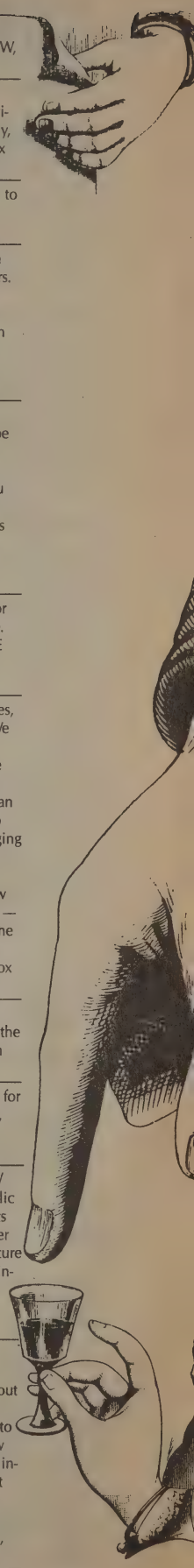
PSYCHEDELIC THINKING is offered on tapes, books, video and software by Lux Natura. We have all of Terence McKenna's material: Recordings of his extraordinary talks. An entire workshop on shamanic ethnobotany. *True Hallucinations,* McKenna's 9-hour Amazonian mind odyssey produced on cassette as radio drama. Recordings of Peruvian shamans singing magical songs in ayahuasca sessions. The classic how-to manual *Psilocybin: Magic Mushroom Grower's Guide.* And now, follow the fractal nature of history — past or future — with *Timewave Zero,* stunning software for the Apple // or MS-DOS (Mac coming). Catalog free from Lux Natura, 2140 Shattuck Ave., Box 2196-WER, Berkeley, CA 94704.

HITCH A RIDE TO EUROPE anytime on a commercial jet for no more than $160 from the east coast, $269 — west coast, or $229 from elsewhere. AIRHITCH® 212-864-2000.

LORIN SMITH — POMO SHAMAN "Songs for Traveling" protection/healing audio cassette, $12.75. L. A. Mertz, Box 14787, Santa Rosa, CA 95402.

I AM SEEKING support/funding/benefactors/interested parties to work on forming a Public Environmental Video Information Service. Its purpose will be to help inform and empower people about integrating their lives with nature and so together create a peaceful and sustainable planet. Please send correspondence/contributions/etc. to: Steve Burke, P. O. Box 1239, Menlo Park, California 94026

TAI HEI SHAKUHACHI are being used by teachers of traditional music in Japan & the USA and by professional musicians throughout the world. The unique precision-cast bore method is an innovation which enables me to make high-quality instruments for a very low price. 75-page catalog/sourcebook includes instruments, books, study guides and the most comprehensive listing of recorded bamboo flute music anywhere. $3 (Refundable with order). Monty H. Levenson, P. O. Box 294-A, Willits, CA 95490.



READER SERVICES: **HOW TO . . .**

Adopt A Library

*Share the **Whole Earth Review** — give a library a subscription! These people have (since last issue):*

Gail and Tremaine Arkley to Silverton Public Library, Silverton, OR; Walker Elementary School, Ashland, OR; Oregon State Correctional Institute, Salem, OR.

These libraries are waiting to be adopted:

White Pine Library, Stanton, MI.

Planetree, San Francisco, CA.

Nacogdoches Public Library, Nacogdoches, TX.

Nautilus Middle School, Miami Beach, FL.

World College West, Petaluma, CA.

Serra Mesa Library, San Diego, CA.

Leland Township Public Library, Leland, MI.

Michigan State University, East Lansing, MI.

Fort Monroe General Library, Fort Monroe, VA.

The Community Library Association, Ketchum, ID.

Ontario, Oregon and Iowa librarians: *Gift subscriptions are available through the generosity of Carol and Tonu Aun, Ed Mead, and Gail and Tremaine Arkley.*

If you would like to adopt a library, *send your contribution to: WER Library Fund, 27 Gate Five Road, Sausalito, CA 94965.*

If you are a librarian *who needs a gift subscription for your library, send your request to Lori Woolpert at 27 Gate Five Road, Sausalito, CA 94965.*

Resolve Sub Problems

If your subscription has a defect, please address all correspondence to us at P. O. Box 38, Sausalito, CA 94966, or call Peter or Susan at 415/332-1716.

Subscribe to *WER*

*Subscriptions to **Whole Earth Review** are $20/one year (4 issues) and $37/two years (8 issues). Foreign rates are $24/one year and $45/two years. For air mail delivery anywhere in the world, add $8 per year. Send your order to: **Whole Earth Review**, P. O. Box 38, Sausalito, CA 94966, or call 415/332-1716.*

Order From Whole Earth Access

*The phrase "or Whole Earth Access" that appears under most of our access information means you can order the product from the Whole Earth Access Company, an outfit inspired by the **Whole Earth Catalog** but not financially connected with us in any way. **Do not send orders to Whole Earth Review.***

Whole Earth Access: 2990 7th Street, Berkeley, CA 94710. 415/845-3000; 800/829-6300.

All orders are shipped UPS unless otherwise specified. $3 shipping-and-handling fee for up to five books, 50¢ for each additional book.

Large orders (over 20 books) will be billed at actual UPS rate.

UPS Blue Label is available at $6.50 for up to five books.

Foreign orders (surface mail): $4 for first two books, 50¢ for each additional book.

California delivery: add 6% tax (BART counties add 6½%). **VISA/MasterCard** orders accepted.

For computers and software: Whole Earth Electronics, 1311-B 67th Street, Emeryville, CA 94608; 800/323-8080.

Change Your Address

Moving? Use our aging but still durable Change-O'-Address card to let us know your new address. Ideally, we'd like to know six weeks in advance, and to have a copy of your old address label.

Rent Our Mailing List

Contact our list manager, Pacific Lists. Call 415/381-0553 and ask for April Soderstrom.

Recent renters: Amnesty International; Christian Science Monitor; Gateways Institute; Planned Parenthood; Real Goods Trading Co.; Smith & Hawken; Yes, Inc.

If you want your name left off mailing list rentals, please write and tell us.

Order Back Issues

EXTINCT issues *(out of print; bound photocopies, $30): #3, 6, 7, 8, 9, 27, 28, 51, 53, 55, 59, 60.*

RARE issues *(we have fewer than ten in our archives; $100): #1, 52, 57.*

ENDANGERED issues *(fewer than 30 in our archives; $50): #4, 10, 13, 14, 50.*

SOON-TO-BE-ENDANGERED issues *(fewer than 40 in our archives; $25): #5, 11, 16, 19, 21, 23, 34, 37, 48, 49, 54, 56, 58.*

PLENTIFUL issues *(any not listed above; $6).*

OUR THREE MOST RECENT ISSUES:

#64. Fall 1989 *— Plants as teachers; a call for a Botanical Peace Corps; highly recommended home-schooling resources; climbing into computers, a working model of cyberspace; why not to divulge your Social Security number.*

#65. Winter 1989 *— The Global Teenager, a first-hand report from around the world; the rock'n'roll revolution in the Baltics, U.S.S.R.; how to teach English in Japan; spontaneous healing and miracle cures; a free worldwide computer network.*

#66. Spring 1990 *— Helping nature to heal, an issue devoted to the nitty-gritty of successfully restoring natural environment, from savannas to old mine pits to forest creeks. Also: a crime lab for animals; being a nonviolent escort in Central America.*

See issue 64 for descriptions of issues 1-32. See issue 65 for descriptions of issues 33-65. All orders are postage paid. Send prepaid orders to Susan Rosberg, 27 Gate Five Road, Sausalito, CA 94965, or call 415/332-1716.

These listings may change with each issue. Act now! Hup hup!

BACK ISSUE ORDER FORM

Issue #_____ @ $_____ = $_____

Issue #_____ @ $_____ = $_____

Issue #_____ @ $_____ = $_____

_____ VISA _____ MasterCard

Card # _____

Exp. date _____

Name _____

Address _____

City _____ State _____ Zip _____

Send to: Whole Earth Review, P. O. Box 38, Sausalito, CA 94966.

Telephone orders: 415/332-1716 *Allow six weeks for delivery.*

P67

How to submit things to *Whole Earth Review*

27 GATE FIVE ROAD, SAUSALITO, CA 94965

1. ***Send them.*** *Address them to* Whole Earth Review, *attention: Assistant Editor, 27 Gate Five Road, Sausalito, CA 94965, and drop them in the mail. We are sitting here, bored as anyone else, reading all the mail, hoping some of it will be good.*

What's good? New, not read a hundred times before, not an imitation of old WER *articles, often a personal passionate statement. Articles that sound like articles are often dead. Consider yourself to be writing a letter to an intelligent, uninformed friend about something that is interesting/important to you. We often print things that everyone, including the author, thought were too odd to be printed anywhere. Remember that we print all lengths from a paragraph to many pages, so don't puff a good, short idea into four tedious pages. And please don't try to please us by creating something you think we'll like. Being hustled is boring. We'd rather print true love — yours for your subject. All things are possible and may be printed. We have no editorial policy for or against any subject matter.*

2. ***Enclose a stamped, self-addressed envelope.*** *That's a courtesy. You are much better at writing your address than we are — all that practice. If you don't address and stamp an envelope for us to reply or return things in, you're asking someone here to be your secretary. If we all did our own clerical work, there would be no secretaries.*

Submissions and reviews can be sent to us electronically on The WELL, our regional computer network (Whole Earth 'Lectronic Link), or via any of the networks that feed into Usenet. Address electronically to hlr@well.sf.ca.us .

3. ***Keep a copy.*** *We are careful and good, but not perfect. You should never send anyone the only copy of anything.*

4. ***Be patient.*** *We sometimes reply on submissions the day we get them, but you shouldn't get worried about no reply for about two months. Sometimes we have to show things to our far-flung, part-time editors, and that can take even longer. On the other hand, don't wait a year to tell us you sent something and didn't get an answer. Many manuscripts will have flowed over the desk in that time, and it will be hard to remember what happened to yours or if we ever saw it.*

5. ***Be legible*** *and put your name and address on the first page of the manuscript. Those are all the rules of form we have. It's helpful to type if you have a typewriter (please double-space), but handwriting is fine if it's very neat.*

6. ***Avoid query letters.*** *Query letters are what writers' magazines tell you to send editors to find out if they are interested in a subject. We're less interested in the subject than in what you do with it. If at all possible, please send us the manuscript.*

7. ***Notes on reviews.*** *Write to that smart ignorant friend, introduce the book or whatever and get out of the way. A paragraph should usually be enough. In book reviews, the quotes are the thing — ideally they should be immediately useful and contain the soul of the book. You don't have to type the quotes, just note page numbers or make a copy of the page. It's not necessary to analyze the book; just say exactly why you love it. It can take a long time to get a final decision from us on a book review. We don't decide about printing it until we've seen the book, which we order from the publisher, who may take a couple of months to send it. (Don't* ***you*** *send the book unless you don't want it back; it's hard enough to deal with returning manuscripts.) If we decide not to use your review, you won't hear further from us. If we do use it, you'll receive a check and tear sheet upon publication.*

We like to review books of all ages, especially unheard-of wonders that got lost in the shuffle.

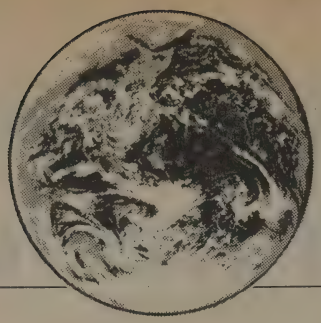
8. ***Photographs for articles.*** *The best by far for us to work with are black-and-white prints (either matte or glossy finish) that are 5x7 or 8x10 inches. We can make do with 3x5s, even color prints. Never send your negatives unless we ask for them.*

9. ***Money and rights.*** *We pay upon publication for everything we use. $15 for letters, $30 for photos, and $100 to $500 for articles. The article money varies depending on length, wonderfulness, and provision of illustrations. Item, book, and software reviews work like this — you get $20 for being the first to suggest an item and $20 for reviewing it. If you do both, you get $40.*

WER *buys first-use rights on material, though we reserve the option to reprint things in the* Whole Earth Catalogs *or our "Whole Earth" newspaper column. (If we reprint you'll receive another fee.) Contributors retain all other rights.*

10. ***Will you still love us*** *if we reject your offering? Editing is arbitrary. It's hard to explain why any given piece is rejected. To understand that, picture yourself leafing through a magazine, not liking an article, and suddenly being confronted by the author who wants you to explain why you didn't like the article. A cogent explanation would be somewhere between awkward and impossible and definitely time-consuming. Our rejection notes tend to be short. It has to be that way if we're to have time to read all the mail carefully. If we turn down your piece, we may not convey in the note that we are grateful for all mail, that mail is all we've got, that the magazine would not exist if it weren't for mail from strangers who are good enough to share the wonders of their world with us.*

We're waiting to hear from you. ■



Stewart Brand — *Publisher Emeritus*
Kevin Kelly — *Editor*

Richard Nilsen — *Assistant Editor*
Corinne Cullen Hawkins — *Editorial Assistant*

Kathleen O'Neill — *Design/Illustration*
Donald Ryan — *Camera/Ecolog*

James Donnelly — *Typesetting/Illustration*
Charlie Oldham — *Camera/Pasteup/Design*

Lori Woolpert — *Production Warrior*
Hank Roberts — *Proofreader*

Richard Ditzler — *Bookkeeper*
David Burnor — *Indexer/Librarian*

Keith Jordan — *Publishing*
Peter Klehm — *Circulation Detective*

Susan Rosberg — *Customer Services Goddess*
Paul Davis — *Reader Services Guru*

Richard Kadrey — *Whole Earth Column*
Stephanie Leonard — *Whole Earth Institute*

Richard Nilsen, Peter Warshall — *Land Use*
J. Baldwin — *Soft Tech/Nomadics/Ecolog*

Robert Horvitz — *Washington Correspondent*
Art Kleiner — *Communications*

Jay Kinney — *Media/Politics*
Susan Erkel Ryan — *Ecolog*

The WELL

Cliff Figallo — *Director*
John Coate — *Marketing Director*

Nancy Rhine — *Customer Support Manager*
Robin Gail Ramsey — *Accounts Manager*

Kenton Hoover — *Chief Engineer*
David Hawkins — *System Administrator*

Hilarie Gardner — *Administrative Assistant*
Patricia Henderson — *Bookkeeper*

Point Foundation Board

Chuck Blitz, **Stewart Brand**, **Doug Carlston**, **Robert Fuller**, **Paul Hawken**, **Huey Johnson**, **Kevin Kelly**

Mailing List Brokers: **Pacific Lists**, Mill Valley, CA; **Triplex Direct Marketing**, San Rafael, CA.

Photo Processing and Reprographics: **Caledonia Camera**, Sausalito, CA; **Marinstat**, Mill Valley, CA.

Printing: **Combined Communication Services**, Columbia, MD.

Financial Report
1st Quarter 1990

INCOME	
Subscriptions/back issues	$ 90,660
Mailing list rental	3,000
Direct distribution	20,279
Newsstand sales	34,460
Book sales	490
Newspaper column	1,019
Contributions	1,754
Other	4,811
Total Income:	**$156,473**
EXPENSES	
Salaries	68,453
Payroll taxes	5,724
Magazine printing	29,419
Circulation promotion	5,347
Subscription fulfillment	10,420
Rent/maintenance/utilities	11,294
Writers/contributors	10,637
Telephone/postage	2,960
Direct distribution	464
Newsstand sales	2,384
Vacation/health insurance	1,914
Other	16,218
Total Expenses:	**$165,234**
MAGAZINE PROFIT/LOSS	**$ -8,761**

POINT FOUNDATION

INCOME	
Whole Earth Institute	35,411
Whole Earth Ecolog	35,000
Whole Earth Review	156,473
Total Point Income:	**$226,884**
EXPENSES	
Whole Earth Institute	6,973
Whole Earth Ecolog	35,000
Whole Earth Review	165,234
Total Point Expenses:	**$207,207**
POINT PROFIT/LOSS	**$ 19,677**

THE WELL

REVENUE	**$161,305**
EXPENSES	
Payroll	$ 60,946
Computer/communications	36,229
Office	7,756
General/administrative	18,065
Sales/support	6,601
Total Expenses:	**$129,597**
PROFIT/LOSS	**$ 31,708**

UNLIKE MOST PUBLICATIONS, *Whole Earth Review* is wholly reader-supported. Subscribers tell us that getting a general-interest magazine without ads is worth something extra. And for us, having readers instead of advertisers as financial backers is why we keep going. We depend on the extraordinary encouragement of our supporting subscribers. Thank you. As another way of indicating your importance, we print your illustrious name and that of your scenic hometown in the magazine (unless you prefer to remain anonymous). Most of your contribution is tax-deductible (check with your tax expert), since we are a nonprofit foundation. Would you consider joining the folks that make this magazine unique? You can join in several ways, at several levels of support:

• **PERPETUAL:** $10,000/life. Perpetuals get a set of back issues (as complete as we have), two copies of every Point Foundation book or product, and get their *WER* in an envelope, air mail, for earthly forever (a Perpetual subscription can be willed to descendants, or passed on to others), as long as we are around.

• **ANGEL:** $5,000/life. Angels get two copies of every Point book or product, and get their *WER* in an envelope, air mail, for the rest of their life or ours, whichever comes first.

• **MANIACAL:** $1,000/life. Maniacs get their *WER* in an envelope, air mail, as long as they (or we) live.

• **MUNIFICENT:** $250/year. Munificents get their *WER* in an envelope, air mail, for a year, and two copies of whatever books we publish that year.

• **SUSTAINING:** $100/year. Sustainers get their *WER* in an envelope, air mail, for a year.

• **RETAINING.** $50/year. Retainers get their *WER* in an envelope, air mail, for a year.

Won't you consider joining our Supporting Subscribers program?

Maniacal Subscribers

Peter C. Akwai
Dreieich-Gotzenhain, West Germany
Denise & Norman Alm
Inchture, Perthshire Scotland
Bamboo Flying Water
New York, New York
Basic Living Products, Inc.
Berkeley, California
Leona & Bruce Baumgart
Los Gatos, California
Donna Boyd & Gene Combs
Lexington, Kentucky
Marlon Brando
Beverly Hills, California
Stephen & Julie Briggs
Moretown, Vermont
Peter Buckley
Mill Valley, California
Continuous Wave
Joe S. Coulombe
South Pasadena, California
Lynn Dondero
San Leandro, California
Robert Dunn
Delmar, NY
Alex Funk
Durham, North Carolina
E. D. Grover
Rolling Hills Estates, California
Eric Haines
Ithaca, New York
Hampshire College Frog
Amherst, Massachusetts
David & Kay Hines
Houston, Texas
Allen Hogle
Gualala, California
Michael O. Johnson
Herndon, Virginia
Kinswoman
Eugene, Oregon
James E. Lovelock
Launceston, Cornwall England
Douglas Martin
Sausalito, California
Russ Molari
Los Altos, California
Mike Nathan
Rochester, New York
W. K. Nelson
Kalispell, Montana
Anne Norcia
Waynesville, Ohio
Nothing Matters
Everything Is Important
Norman Pease
Orinda, California
Plant Just One Tree
Love, Ma
Marcelo C. Rocha
Rio de Janeiro, Brazil
Jim Sanders
Paia, Hawaii
Jim Sells
Corrales, New Mexico
Norman & Joanna Sher
Brooklyn, New York
Katherine W. Tremaine
Santa Barbara, California
Bob Wallace
Seattle, Washington
David Williams
Leeds, England
Greg & Pat Williams
Gravel Switch, Kentucky
Ye Olde Toothe Fairye
Birmingham, Alabama
and 11 anonymae

Munificent Subscribers

Jules Alciatore
Metairie, Louisiana
Paul Berglund & Lois Brady
Grubville, Missouri
J. L. Kirk
McLean, Virginia
Jim Peske
Rochester, Minnesota
Ted & Trudy Winsberg
Boynton Beach, Florida

Sustaining Subscribers

Grant Abert
Readstown, Wisconsin
Louis Anella
Somerville, Massachusetts
Tremaine & Gail Arkley
Independence, Oregon
Frank Bernstein
Had Ha Sharon, Israel
Bijou Art Cinema
Eugene, Oregon
Charles Bouril
Yountville, California
Mrs. Julia M. Brand
Rockford, Illinois
Fairleigh Brooks
Louisville, Kentucky
Max Buehlmann
Bremgarten, Switzerland
Bob & Phyllis Clark
Vashon, Washington
Stephen F. Coady
Dallas, Texas
Mark Cohen
Winchester, Massachusetts
Jerry Crutcher
Rockville, Maryland
Richard Daly
Madison, Wisconsin
Michael J. Davey
Sunnyvale, California
Gail Dawson
Columbia, Maryland
John Delantoni
San Francisco, California
Fred Dick
La Farge, Wisconsin
Daniel Drake
Mill Valley, California
Roger Easton
Henrietta, New York
Raymond A. Elseth
Palatine, Illinois
Will & Janie Endres
Prospect Hill, North Carolina
Walter & Kitty Enloe
Hiroshima, Japan
Dwight A. Ernest
Milton Keynes, England
Zvi Flanders
South Lyon, Michigan
Anthony Flesch
Santa Monica, California
Robert Fuller
Guilford, Connecticut
FXTX
Oakland, California
J. A. Haynes
Hamilton, Montana
John T. Hoagland
Lansing, Michigan
K. Hoover
San Francisco, California
Paul Hopkins
Tolland, Connecticut
In memory of Frank Simons
Brookline, Massachusetts
Jennifer de Jung
Reno, Nevada
Mark Kiemele
Ponteland, Newcastle-on-Tyne, England
Bill Kilpatrick
Beverly Hills, California
J.L. Kirk
McLean, Virginia
Jack Landman
Fort Worth, Texas
Robert H. Larson
San Diego, California
Marta J. Lawrence
Easton, Connecticut
Peter Lit
Elk, California
Alexandra Martin
Santa Fe, New Mexico
Donald C. Meyers
Front Royal, Virginia
Val Morgan
Renton, Washington
Thomas Northwood
Brookline, Massachusetts
Adam Phillips
Washington, D.C.
Lyle Poncher
Los Angeles, California
William Ryder
Miami, Florida
Steve Schmid
Thermal, California
Paul Schwartz
Amsterdam, The Netherlands
Jane Sibley
Boston, Massachusetts
Layne & John St. Julien
Baton Rouge, Louisiana
C. Allen Waddle
Los Angeles, California
Gary Waldron
Laguna Beach, California
James F. Wanner
Charlotte, Vermont
John F. Warren
Pittsburgh, Pennsylvania
Joe Weisman
San Francisco, California
Chris Whatley
Austin, Texas
Timothy W. Wheeler
Hong Kong
Gwendolyn Wilkins
Fort Lauderdale, Florida
Phil Wood
Berkeley, California
John Wright
Escondido, California
Pamela Zave
Chatham, New Jersey
Arnold M. Zwicky
Columbus, Ohio

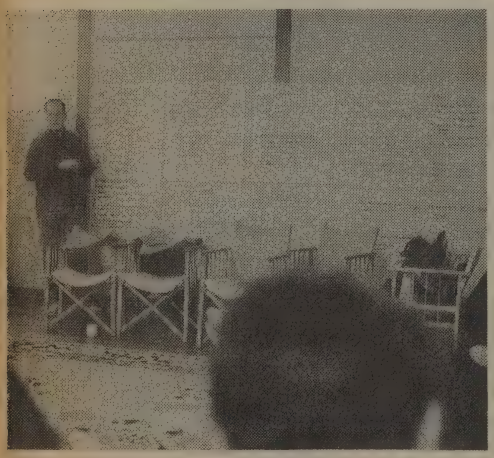
and 1 anonymoose

Retaining Subscribers (Since Last Issue)

Mads Bryde Andersen
Copenhagen, Denmark
Nancy Connable
Kalamazoo, Michigan
Todd A. Coram
Washington, DC
Mark Gunther
San Francisco, California
Bob Jones
Collinsville, Illinois
Steven F. Jones
Portland, Oregon
J. H. H. Lowengard
New York, New York
Jo Ann Mandinach
Palo Alto, California
Steve Paulk
Tabernash, Colorado
David Whittlesey
Prescott, Arizona

Kevin Kelly (2)

A most refreshing thing happened a few months ago. The entire staff of Whole Earth daydreamed together for two days. Members of Point's board joined us for one of them. We met in an airy room at the Green Gulch Zen Center, in Mill Valley, California. No shoes, cold feet, serene garden view, passionate, clear-headed ideas. Leading us on this retreat was Richard Steckel, author of Filthy Rich & Other Nonprofit Fantasies, *who was recommended to us by board member Chuck Blitz, and who was paid for by one of our Maniacal subscribers. (Thank you, J.M.)*



Steckel calls his process a Polaroid Planning Process — an organizational self-portrait which begins obscure, but gradually gets clearer until something recognizable pops out. Several prominent things became clear in our snapshot: 1) the need for a Director of Point Foundation, to manage the expanding ventures we are launching (by the way, if you are a serious candidate, please contact us quickly); 2) the virtue of having a more articulate definition of "who we are"; and 3) the benefits of a better understanding of who our readers are.

In short, as an organization we are growing up.

Steckel's method works in a two-stroke cycle. It is pragmatic and simple enough to pass on that I'll summarize it here for others to use. First, he says, state "who you are." Then prove it. Provide supporting evidence for any claim you make. Include statements by others outside. Vague self-opinions don't count. Second, state "who you are five years from now." Prove it. Suggest what kind of evidence you'd need five years hence to demonstrate your claims. Then come up with five projects that will take you in the five-year direction, and use your supporting claims to win backers for the projects. A couple of avenues Point is exploring are a 900 telephone information service, more conferences and gatherings, and perhaps a video or radio production.

Coming up with a definition of who we are was the most tortuous and least successful thing we attempted. We made a list of 59 terms we tend to use about ourselves, but few of them would really stick under scrutiny. When we try to promote this magazine, we fail to come up with an adequate phrase to convey to strangers what happens here. To say that the magazine is continually trying to re-invent itself is true, but a cliche. Someone on the staff suggested that WER *is a "niche-resistant" magazine — we don't fill niches, we discover and define them. Stewart pointed out that we are a magazine most challenging to its own readers — the "attractive nuisance" publication. Other known Whole Earth traits: unpredictable, contradicts itself, heeds its own mind, ruled by untamed curiosity, seeks solutions, liable to bash its heroes, unashamedly pragmatic, and operationally transparent.*

One thing we do that we hadn't realized was so important is "forging communities." As Paul Davis, our sub guru, said on the WELL (a prime example of a Point-forged community), "I believe our business is providing connections between interesting people and ideas." Here are some other suggestions of "who we are" from people on the WELL:

Point is/should be a high-priced connection. It's where you go when you don't know where to go. —Jon Carroll

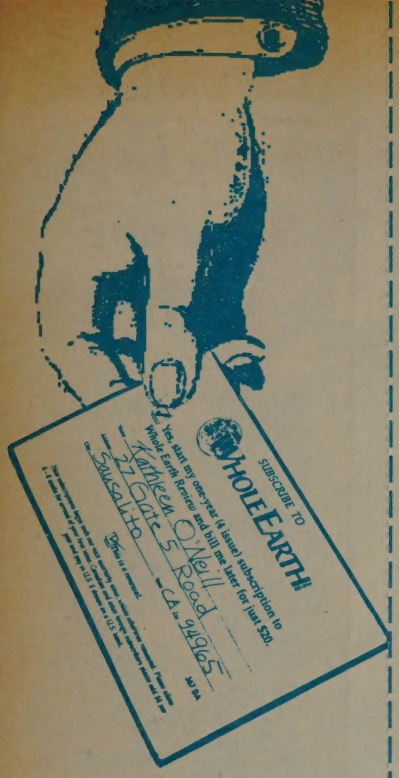
Point points out the interesting part of what you're *not* thinking about.
—Wayne L. Tack

It's for following the fringes that become central as we move forward.
—Robert Horvitz

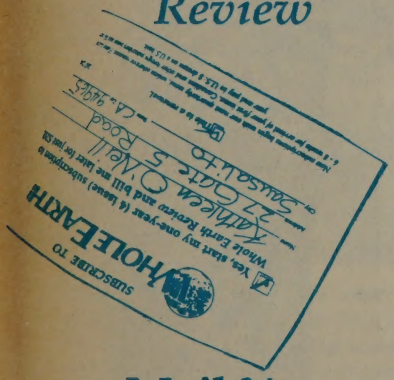
Uncommon ideas to build a common understanding and a common-unity.
—Kathy L. Dalton

Point is about empowering individuals by giving them tools and showing them how to better fulfill their own purposes and passions. The agenda is self-education.
—Dan Drasin

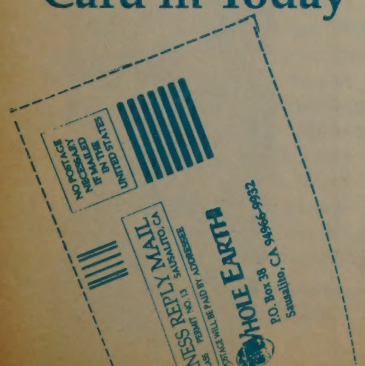
You can help with teasing this out. Very likely you have a more accurate picture of us than we do ourselves. Send it in to us. (While you are at it, tell us about a book, resource, or publication you are currently in love with.) Your letter will cure two of our uncertainties with one stamp: capsulizing what we do, and finding out about you, our reader. —*Kevin Kelly*



Stimulate Your Own Reality With a Subscription to *Whole Earth Review*



Mail Your Card in Today



SUBSCRIBE TO WHOLE EARTH REVIEW

☑ **Yes, start my one-year (4 issue) subscription to *Whole Earth Review* and bill me later for just $20.**

Name _____

Address _____

City _____ State _____ Zip _____

☐ *This is a renewal.* 367

New subscriptions begin with our next quarterly issue, unless otherwise requested. Please allow 6 - 8 weeks for arrival of your first issue. Canadian and other foreign subscribers please add $4 per year and pay in U.S. $ drawn on a U.S. bank.

SUBSCRIBE TO WHOLE EARTH REVIEW

☑ **Yes, start my one-year (4 issue) subscription to *Whole Earth Review* and bill me later for just $20.**

Name _____

Address _____

City _____ State _____ Zip _____

☐ *This is a renewal.* 367

New subscriptions begin with our next quarterly issue, unless otherwise requested. Please allow 6 - 8 weeks for arrival of your first issue. Canadian and other foreign subscribers please add $4 per year and pay in U.S. $ drawn on a U.S. bank.

CHANGE YOUR ADDRESS

Moving? Want your magazines to move with you? Send us this handy card.

Look on your address label for your Subscriber ID number: _____

Date new address takes effect: _____

OLD ADDRESS

Name _____

Address _____

City _____ State _____ Zip _____

NEW ADDRESS

Name _____

Address _____

City _____ State _____ Zip _____

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 13 SAUSALITO, CA

POSTAGE WILL BE PAID BY ADDRESSEE

WHOLE EARTH Review
P.O. Box 38
Sausalito, CA 94966-9932

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 13 SAUSALITO, CA

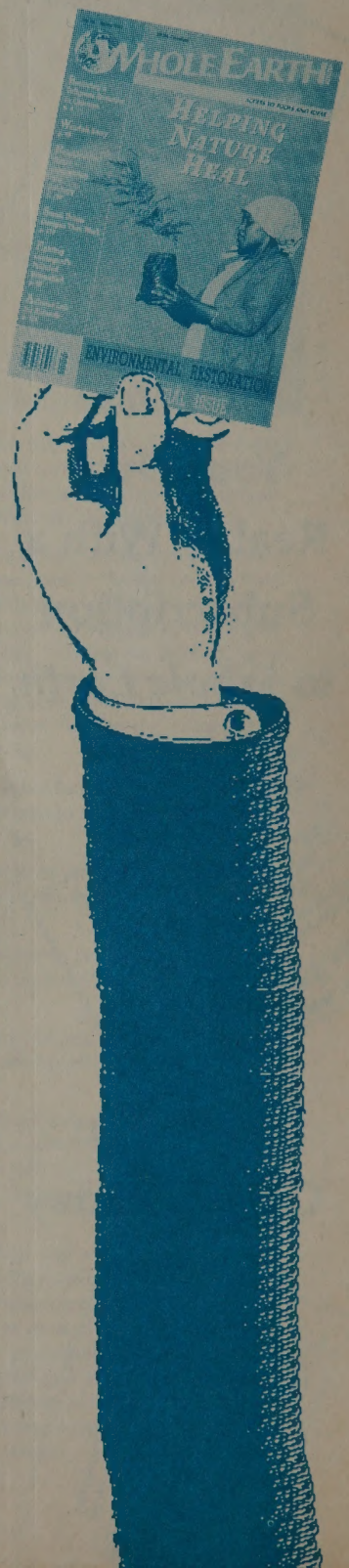
POSTAGE WILL BE PAID BY ADDRESSEE

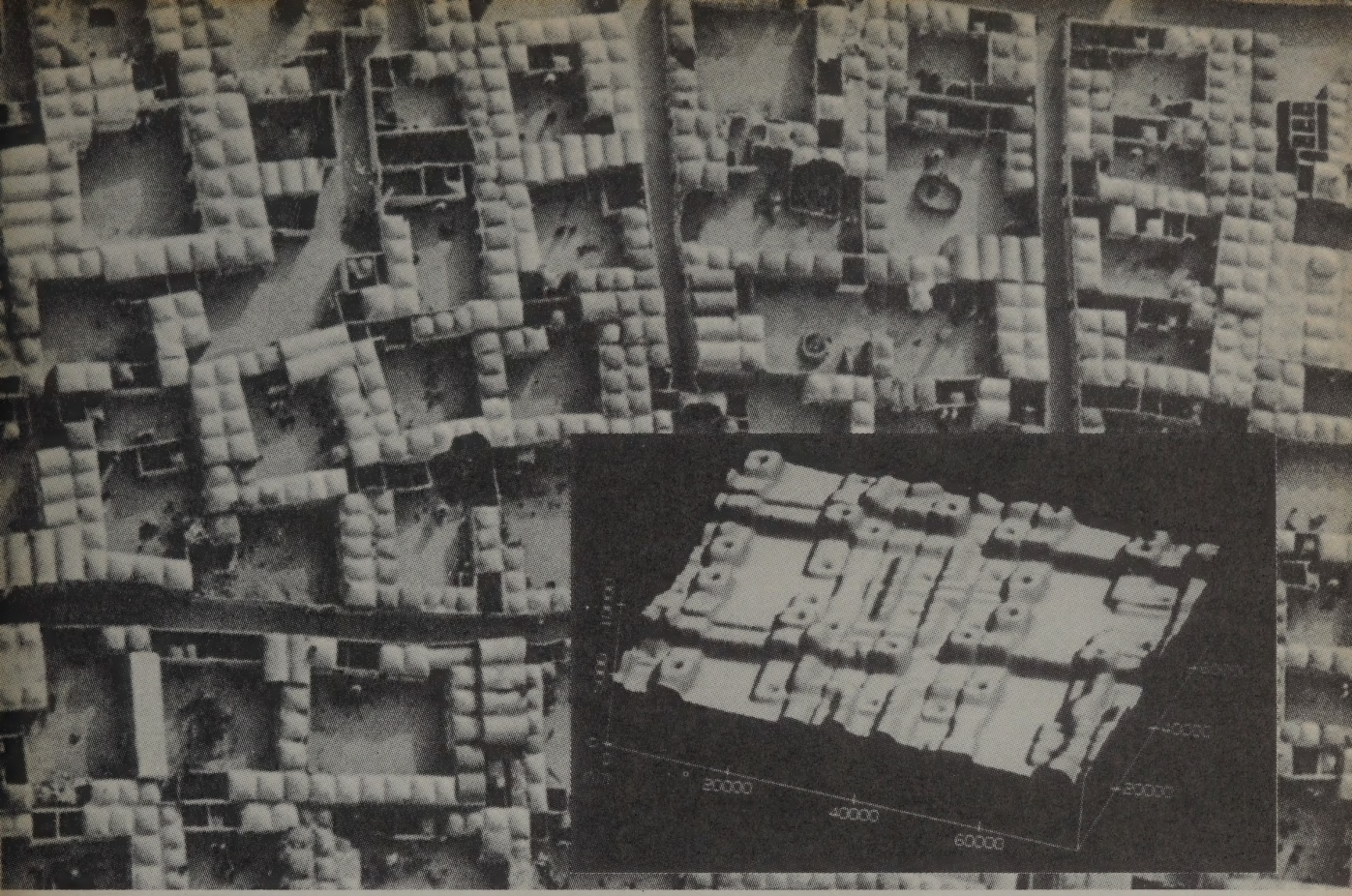
WHOLE EARTH Review
P.O. Box 38
Sausalito, CA 94966-9932

PLACE STAMP HERE

WHOLE EARTH Review
P.O. Box 38
Sausalito, CA 94966-9932

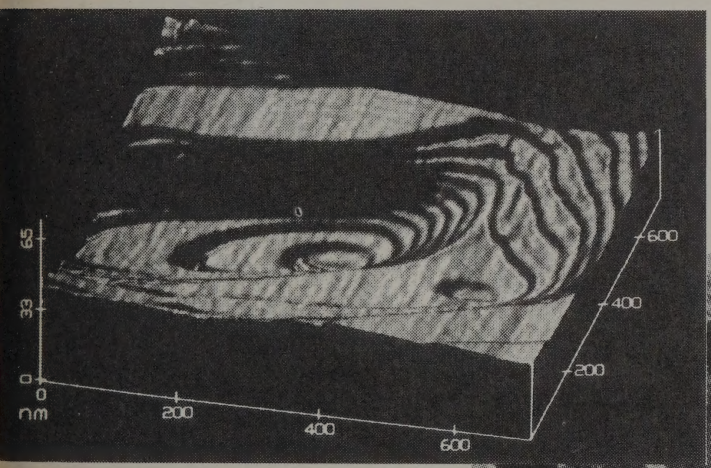
Don't Miss A Single Issue Subscribe today.

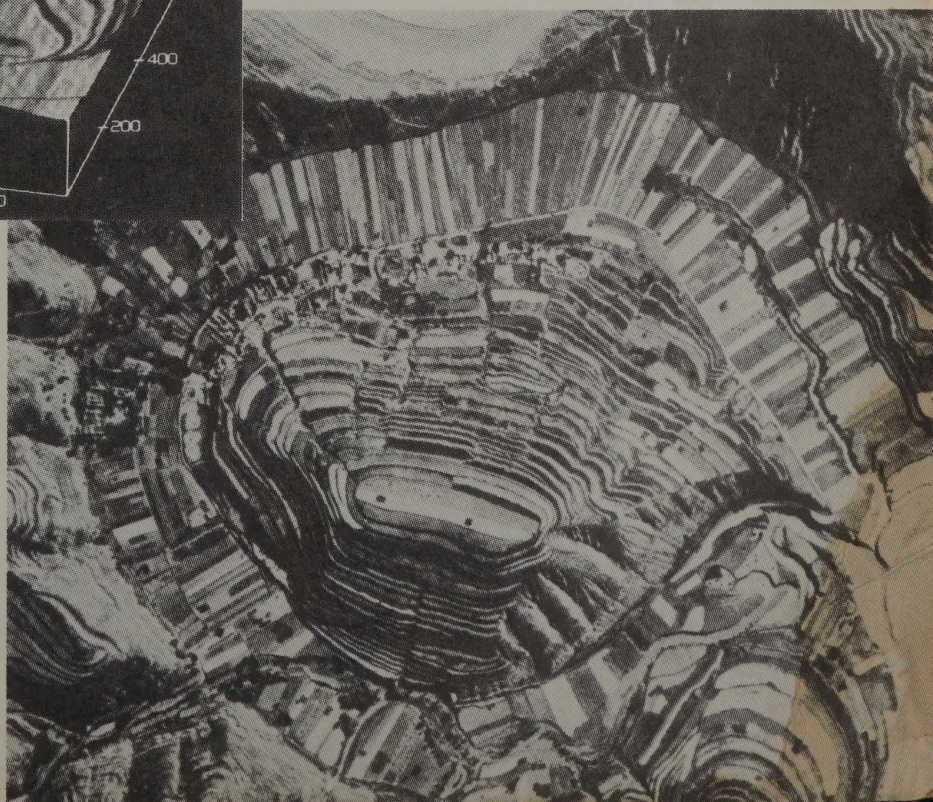




Above, background: About one thousand feet over the adobe domes and cylindrical vaults of the town of El Oued, in Morocco. *Foreground:* Smack up against an 80-nanometer section of an integrated-circuit chip viewed by a scanning tunneling microscope (STM).

Nano Landscapes





Right, background: Aerial view of a cultivated oxbow in the Yangtze River, China. *Above, foreground:* A nano-perspective of the crystal layers in a pit on the surface of a speck of mica.

Japanese researchers have recently coupled a tactile feedback glove (see p. 86) with an STM. The STM "sees" by riding a stylus over the atomic landscape, translating its up/down location into a visual map. Instead of rendering that information graphically, the researchers convey it tactilely as bumps and texture. You move your virtual hand over a small bit of matter and you can actually *feel* the molecules.

Aerial shots from *The World From Above;* Nano-shots from Digital Instruments.

Kjell Sandved, a lecturer at the Smithsonian, noticed an "F" in a butterfly wing 15 years ago. He wondered if other letters were out there in nature, so with camera in hand, set out on an amateur quest. One hundred thousand pairs of wings later, he came up with two sets of a complete alphabet with numbers. This one (he calls it the "vertical one") features letters found mostly in mounted butterfly wings (a few moths, and a few live specimens) from Africa, South America and other butterfly havens. Sandved is now collecting his third butterfly alphabet.

Copies of his posters (18" x 24") can be ordered for $12.95 postpaid (or $21 postpaid for ones signed by the photographer) from Sandved & Coleman Photo, 12539 North Lake Court, Fairfax VA 22033; 703/968-6769.

A BUTTERFLY ALPHABET